

JPRS-UCH-89-001  
2 FEBRUARY 1989



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# ***JPRS Report***

# **Science & Technology**

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***USSR: Chemistry***

# Science & Technology

## USSR: Chemistry

JPRS-UCH-89-001

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UDC 541.047.7:546.17.28

**Reactions of Silicon With Activated Nitrogen and Oxygen in Condensed Discharge Afterglow**  
18410375d Moscow *ZHURNAL FIZICHESKIY KHMII* in Russian Vol 62 No 6, Jun 88 (manuscript received 17 Jul 87) pp 1703-1705

[Article by Ye. A. Rubtsova, V. M. Belova, L. I. Nekrasov, and K. A. Mednikov, Moscow State University imeni M. V. Lomonosov, Department of Chemistry]

[Abstract] Data concerning the interaction of silicon at low pressure and nitrogen that has been activated in a condensed discharge and that contains  $10^{15}$  cm<sup>-3</sup> nitrogen atoms and  $10^{11}$  cm<sup>-3</sup> admixtures of the oxidant in a nitrogen flow (studied at 3.3 gPa and 800-1,150°C) were presented and discussed. Direct contact of the silicon with the active medium produced faster oxidation than did thermal oxidation of silicon activated by admixtures with a rate of growth of dioxide layers of 2.3-6.5 Angstroms/minute. Silicon oxidation was predominant in spite of a high concentration of nitrogen atoms in the reaction zone; there was no nitrogen in the growing layer. Aging the system in active hydrogen partially removed the oxygen from the surface; this reduced the concentration of the active oxidant in the gaseous phase, and the reaction rate of silicon nitrification and oxidation became commensurate with the formation of hydroxynitride. The nitrogen atoms diffused through the relatively thin, slowly growing layer to the inside interface and nitrated the silicon. During rapid oxidation, diffusion of the nitrogen atoms was impaired at a certain thickness of the growing layer; active particles did not reach the silicon surface, and nitration did not proceed. Figures 4; references 5 (Western).

UDC 537.311.33

**Nature of Conducting Properties of Polymer-Film Detector Based on Polyvinyl Alcohol With Low-Molecular Additions of Iodine and Dithizone Molecules**  
18410375a Moscow *ZHURNAL FIZICHESKIY KHMII* in Russian Vol 62 No 6, Jun 88 (manuscript received 27 Oct 87) pp 1687-1689

[Article by L. A. Gribov, O. B. Zubkova, and B. L. Fayfel, Moscow Agricultural Academy imeni K. A. Timiryazev]

[Abstract] A study examined the band structure of different models of film elements and molecular structures that model sorption by a using a detector of diethylamine, ethylamine, acetone, and sulfur dioxide. The study was based on a method developed by the authors. This provided the first theoretical substantiation of the semiconducting properties of the polymer-film detector and revealed the basic mechanisms of formation of its conducting properties. The presence in the film element of a detector of dithizone molecules, which ensures detection

of conductivity in the system, was of fundamental importance, and compact filling of the surface layer by dithizone molecules was necessary. Polyvinyl alcohol served only as a polymer base for formation of the film element but did not affect its conducting properties. The conducting properties of the detector depended upon the type and structure of the material sorbed; they ensured its selective properties. The molecular structure that ensures sorption of the diethylamine film element possessed the best conductivity. Figures 2; references 6 (Russian).

UDC 541.15:541.28

**Chemical Erosion of Irradiated Graphite**  
18410375b Moscow *ZHURNAL FIZICHESKIY KHMII* in Russian Vol 62 No 6, Jun 88 (manuscript received 11 Nov 87) pp 1690-1691

[Article by L. I. Tsetskhladze, L. I. Cherkezishvili, and N. Ya. Tsibakhashvili, Institute of Physics, GSSR Academy of Sciences, Tbilisi]

[Abstract] A study examined the chemical erosion of graphite. Two types of graphite having different structural and physical properties were studied to identify the chemical processes ensuing in the graphite under the effect of tritium recoil atoms. Graphite annealing liberated three types of gases, radiohydrogen, radioactive methane, and ethylene; the last 2 substances are products of the chemical erosion of the graphite after irradiation by tritium. It was assumed that the high-energy atoms of tritium recoil cause significant chemical erosion of graphite, which is manifested both in the formation of products with the capacity to be liberated from a solid body (radiohydrogen, methane, and ethylene) and tritium compounds consisting of a structural admixture of graphite. These substances are also products of the chemical erosion and are destroyed only after complete combustion of the graphite. Figures 2; references 4 (Russian).

**Volumetric Recombination of Nitrogen Atoms in Condensed Discharge Afterglow**  
18410375c Moscow *ZHURNAL FIZICHESKIY KHMII* in Russian Vol 62 No 6, Jun 88 (manuscript received 1 Jun 87) pp 1694-1699

[Article by O. M. Knipovich, Ye. A. Rubtsova, and L. I. Nekrasov, Moscow State University imeni M. V. Lomonosov, Department of Chemistry]

[Abstract] This article discusses a study of the production of significant concentrations of atomic nitrogen in a pulsed condensed discharge and the breakdown kinetics of the nitrogen afterglow and subsequent recombination of nitrogen atoms in the discharge. The study revealed the complex nature of processes proceeding in the nitrogen afterglow of the condensed discharge. The basic feature of the processes were (1) the reaction of volumetric recombination of the nitrogen atoms in the basic state



with participation of a third particle that makes some contribution to the surface processes at low pressure and (2) reactions with participation of excited nitrogen molecules that become activated in the discharge. Effective values of the constant of volumetric recombination of the nitrogen atoms, calculated from the experimental data, approximated those found in the literature. They reflected the overall rate of disappearance of nitrogen atoms and depended on experimental conditions. Figures 2; references 16: 5 Russian; 11 Western.

**Synthesis of Cyanhydrine Esters and Their Nuclear Magnetic Resonance Spectra**  
18410376e Kiev UKRAINSKIY KHIMICHESKIY  
ZHURNAL in Russian Vol 54, No 7, Jul 88  
(manuscript received 9 Dec 86) pp 723-728

[Article by R. Maduar, M. Yu. Kornilov, and A. V. Turov, Kiev University]

[Abstract] Interaction of aromatic aldehydes and acylhalogenides with acetonecyanhydrines in the presence of triethylamine resulted in the formation of cyanhydrine esters with a yield of nearly 50-60 percent. Two different pathways of the reaction were discussed. A study of  $^1\text{H}$  and  $^{13}\text{C}$  nuclear magnetic resonance spectra of the substances synthesized was described and discussed. References 10: 4 Russian; 6 Western.

UDC 551.352

**Radiochemical Study of Iron-Manganese Concretions of Pacific Ocean**  
18410377e Leningrad RADIOKHIMIYA in Russian  
Vol 30 No 3, May-Jun 88 (manuscript received  
2 Nov 87) pp 405-410

[Article by Kh. A. Arslanov, V. Yu. Kuznetsov and A. N. Kulikov]

[Abstract] This study showed the accuracy of using a method for the simultaneous determination of  $^{238}\text{U}$ ,  $^{234}\text{U}$ ,  $^{232}\text{Th}$ , and  $^{230}\text{Th}$  isotopes from one weighed quantity in five iron-manganese concretions. An ionium method and an  $\alpha$ -radiography method were used to determine the age and rate of growth of iron-manganese concretions from the northeastern, central, and southern

troughs of the Pacific Ocean. The ionium dating method was more accurate than was the ionium-thorium method of dating the concretions. Differences between the concretion growth rate calculated by the ionium method and that calculated by overall  $\alpha$ -radioactivity were attributed to migration of  $^{226}\text{Ra}$  into the concretions. Figures obtained in the study for the rate of formation of iron-manganese concretions varied within the range of 2.5-12.0 mm/ $10^6$  years and agreed with findings of other researchers. Figures 3; references 13: 4 Russian; 9 Western.

UDC 541.11:541.64:542.97

**Change in Thermal Behavior of Epoxyoligomers Upon Introduction of Metal-containing Carbon Fibers**

18410379a Minsk DOKLADY AKADEMII NAUK  
BSSR in Russian Vol 32 No 8, Aug 88 (manuscript  
received 27 Nov 87) pp 722-725

[Article by V. I. Dubkova and I. N. Yermolenko, academician BSSR Academy of Sciences, Institute of General and Inorganic Chemistry, BSSR Academy of Sciences]

[Abstract] A study of the effect of metal-containing carbon fibers on the conversion of epoxyoligomers during their combined heat treatment used epoxyoligomers having different chemical natures. Chemical and thermal analysis methods were used. The metal-containing carbon fibers had a considerable effect on the entire complex of physicochemical processes proceeding at the fiber-polymer interface. The complex, incompletely revealed the structure of the metal-containing carbon fibers themselves, and the unlike state of different metal-containing inclusions on their surface made it difficult to compare the metal-containing carbon fibers with regard to their activity toward any one oligomer. The dependence of the nature of thermal conversions on the chemical structure of the oligomer studied, under the effect of one and the same form of metal-carbon fiber, was established. Selectivity with regard to preferred cross-linking of the oligomers under the effect of carbon fibers was observed. Figure 1; references 8: 6 Russian; 2 Western.



UDC

541.128.3:541.124:542.952.6:541.64:547.539:491.3:546.564

**Trimerization Catalysis of Phenylisocyanate in Presence of Mannich's Phenol Bases**

18410371c Moscow KINETIKA I KATALIZ in Russian Vol 29 No 3, May-Jun 88 (manuscript received 22 Apr 87) pp 586-590

[Article by A. V. Selivanov, L. A. Zenitova, I. N. Bakirova, and P. A. Kirpichnikov, Kazan Chemical-Technological Institute imeni S. M. Kirov]

[Abstract] An infrared spectroscopic study of the kinetics of cyclic trimerization of phenylisocyanate in the presence of Mannich's phenol bases was described and discussed. The catalysis mechanism of the reaction was described. Passage of trimerization required the presence, in the catalyst molecule, of a hydroxyl group and a tertiary nitrogen atom that produced a reaction of the catalyst in the OH-group and its conversion in the form of urethane into allophanate, which was reconstructed as a result of tautomeric regrouping into a bipolar ion that is the center of catalysis. The effect of the number of aminomethyl, hydroxyl, and the electron donor and electron acceptor substituents in the structure of the Mannich's bases was discussed. Figures 4; references 5 (Russian).

UDC 541.128.13:541.124.7:[546.11+546.13]:546.26

**Possibility of  $H_2+Cl_2$  Catalytic Interaction**

18410371d Moscow KINETIKA I KATALIZ in Russian Vol 29 No 3, May-Jun 88 (manuscript received 26 Sep 86) pp 726-728

[Article by I. I. Kurlyandskaya and A. I. Rozlovskiy]

[Abstract] It was shown that the amount of hydrogen conversion during its interaction with chlorine in a mixture at 200 degrees through a layer of active carbon equals the effective constant of the reaction rate, which is three times greater than that calculated for a homogeneous reaction in a regime of equilibrium dissociation of chloride. In view of this, it was assumed that the role of the heterogeneous-catalytic process is the predominant role in this case. The rate of homogeneous reaction, having a high temperature coefficient, became commensurate with the rate of heterogeneous reaction upon a temperature increase up to 300 degrees. In general, the ratio of the rates of chlorination for the homogeneous chain mechanism and the heterogeneous-catalytic mechanisms of the reaction depended on conditions of the experiment. References 11 (Russian).

**Effect of Aluminum Oxide on Process of  $V_2O_5$  Reduction**

18410376b Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 54 No 7, Jul 88 (manuscript received 1 Dec 86) pp 696-698

[Article by N. P. Samchenko, Z. M. Zdornaya, G. I. Golodets, V. I. Kutepov, L. V. Frolova, and R. M. Masagutov, Institute of Physical Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] The thermogravimetric method was used to study the reduction of  $V_2O_5$  in the system  $V_2O_5-Al_2O_3$  as a function of the aluminum oxide level. Aluminum oxide in the system  $V_2O_5-Al_2O_3$  significantly increased the rate at which vanadium pentoxide was reduced and reduced the initiation temperature of the reduction. Changing the ratio of components in the system made it possible to regulate the strength of the V-O bond. Figures 3; references 4 (Russian).

UDC 541.128.1+42.973

**Oxidation of n-Butane Into Ethylene Oxide on Photoprepared Molybdenum**

18410376c Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 54 No 7, Jul 88 (manuscript received 10 Feb 87) pp 698-702

[Article by V. M. Belousov, Ye. V. Kashuba, L. V. Lyashenko, and B. G. Mischanchuk, Institute of Physical Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Photoprepared contacts that are made up of a complex of metals, that are synthesized by using photochemical reactions (photoprepared), and that contain transition metal ions catalyze n-butane in an oxygen-containing compound at 330-350 K. This article describes a study that determined the composition of the products formed in these reactions and discusses the mechanism of their formation. Photoprepared molybdenum-containing and tungsten-containing contacts were synthesized from  $MoCl_5$  and  $WCl_6$ . The catalysts were tested in a circulating assembly. The working mixture contained 1 percent (by volume) n-butane in air. The n-butane was oxidized on the photoprepared complexes of molybdenum-containing and tungsten-containing contacts in two temperature ranges. The only product of oxidation in the low-temperature region (330-350 K) was ethylene oxide, in contrast to the high-temperature region (above 510 K), at which the oxidation products produced were acetic aldehyde, carbon dioxide, and metacrolein. The mechanism of the reaction in these temperature intervals was hypothesized and discussed. Figures 2; references 6: 3 Russian; 3 Western.

### Present and Future of Hydrogen as Power Source

18410038c Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 28 Sep 88 p 1

[Article by R. Akhmetov, TASS: "Uses of Hydrogen"; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] The seventh world conference on hydrogen power has completed its work in Moscow. Its theme was "Hydrogen Today." A. Protsenko, chairman of the organizing committee of the forum and chairman of the USSR State Committee for the Utilization of Atomic Energy, reports on the present state and prospects for the development of this area of power generation in our country.

Hydrogen and hydrogen-containing gas mixtures are used in many branches of industry. Large producers of ammonia and methanol will remain the largest users of hydrogen up to the year 2000. And the chief raw material for its production is natural gas. But according to experts, by the turn of the century the widespread use of hydrogen will become economically feasible also in new, nontraditional areas—specifically in power generation, production of synthetic liquid fuels from coal, petroleum processing and petrochemistry, and metallurgy.

Studies by Soviet and foreign scientists have shown that hydrogen can be effectively used to solve a number of complex problems in promising areas of power generation. Let us consider one of these problems. The consumption of electric power is high in the daytime when plants are operating at full capacity. On the other hand, it is sharply lower at night. But atomic or thermal power plants cannot be shut down until the morning. They continue to operate. Therefore the excess power produced at night can be used to produce hydrogen from water. And in the daytime or in the evening when the generating capacity may be insufficient, hydrogen can be burned in power plants to produce electricity.

In recent years, a number of studies on the use of hydrogen in motor vehicles have been conducted abroad as well as in our country. An experimental lot of microbuses fueled with gasoline and hydrogen has been produced in Riga and tested since 1986. Their use has shown that under city driving conditions the addition of hydrogen will make it possible to reduce the gasoline consumption by nearly 50 percent and to significantly reduce the toxicity of exhaust gases. Plans call for beginning the production of small series of such motor vehicles, about 100 a year, during the next five-year-plan.

Successful studies are being conducted on using liquid hydrogen as fuel in aviation and space technology. The flight testing of the experimental TU-155 airplane and

the launching of the Energiya satellite-carrier rocket clearly demonstrate their high level of development.

To satisfy the growing demand for hydrogen, it is necessary to utilize additional resources and to increase the delivery of existing technologies. It is possible to do this. For example, by using a special method, it is possible to produce more than 25,000 tons of hydrogen a year from coke-oven gas burned in flames. Large ethylene producers are capable of increasing the production of hydrogen by almost 50 percent.

Electrolysis of water is one of the most promising methods of production of hydrogen. According to preliminary data, high-temperature electrolyzers will make it possible to lower the energy consumption by one third to one half of the present consumption and promise to produce hydrogen cheaper than from natural gas. Prototypes of solid-polymer electrolyzers have been manufactured. They are smaller and are capable of producing 5 and 25 cubic meters of hydrogen an hour with a lower power consumption.

But we must not forget that hydrogen is a secondary resource; it is not found in the free state in nature. Energy and raw materials are needed to produce it. Therefore it is extremely important to protect human health and nature during the production of hydrogen. Harmful emissions should be minimized. This requirement is satisfied by systems in which the main raw material for the production of hydrogen is water and the energy is supplied by a high-temperature gas-cooled nuclear reactor.

It is true that all of the ecological aspects of hydrogen power generation and technology are not yet clear today. In particular, it is necessary to thoroughly study the effect of hydrogen used as aviation and space/rocket fuel on the stratospheric ozone layer. That some ecological restrictions on the development of hydrogen power generation and technology may arise in the future cannot be ruled out.

So far, the use of hydrogen in motor vehicles, aviation, power generation, and industry shows that using hydrogen makes it possible to sharply reduce harmful emissions into the atmosphere and to save a considerable quantity of valuable petroleum and gas raw materials. It can be said with certainty that the development of hydrogen power generation and technology will contribute to a successful solution of important economic problems and to environmental protection.

The solution of these problems can be accelerated by the international collaboration of scientists. Soviet specialists are prepared to carry out joint studies and development work with their foreign colleagues. We hope that the Moscow conference will serve the noble cause of unification of the scientists of various countries for the benefit of all mankind.

**Posthumous Article by Chernobyl Victim  
Academician V. A. Legasov**

*18410381 Moscow KHIMIYA I ZHIZN in Russian No  
7, Jul 88 pp 10-17*

[Article by the late Academician V. A. Legasov, with editorial introduction: "Monologues About What is Important"; first eight paragraphs appear in boldface in source]

[Text] There will not be any monologues. There will only be this first article of a planned series of articles. Because on April 27, two years after the Chernobyl disaster, there was one less hero of Chernobyl, Academician Valeriy Alekseyevich Legasov.

He was one of the youngest and most active members of our editorial board. He was one of our authors and advisers, someone who would unfailingly respond to a call for assistance in the most difficult of times—he could not do otherwise. He was a frightfully busy person, working from 12 to 14 hours a day on the frontier of chemistry and nuclear physics, which are so exceptionally important to science and life. He nevertheless found time to work on the journal which he regarded as his own.

He flew out to Chernobyl on the morning after the accident and stayed there during the very blackest and poisonous days and nights of the time—until the middle of May. In all, he spent four months at Chernobyl, instead of the two to three weeks that is deemed acceptable. But not even this was the most difficult for him. During all those months, it was he who shouldered the responsibility for making the physico-chemical decisions upon which the fate of an entire region would depend for many years after. He suggested the composition of the mixture that was sprinkled on the hot reactor, and because of that, the Chernobyl tragedy turned out to be less catastrophic than it could have been.

It took no less courage on his part to insist at various levels of authority, including the highest, that it was essential to inform people fully about the scale and potential consequences of what had happened. His report at the conference of IAEA experts in Vienna elicited applause from even those who went there for the purpose of creating obstructions for Soviet nuclear scientists. Even our enemies were convinced by the frankness and the reasonable presentation of his four-hour paper.

He was quite ill in his last years. The days and nights at Chernobyl had taken their toll. But Valeriy Alekseyevich was not killed by radiation alone. The entire set of circumstances that led him to suicide will have to be investigated fully.

He was buried at Novodevichye. After all, he was an academician and member of the Presidium... Pay your respects to his grave when you can. But to us who knew

Valeriy Alekseyevich, it still seems that if it was not his fate to live long, then it would be better for him to lie next to other heroes of Chernobyl who gave their lives, like he did, so that others would survive.

He was an outstanding scientist and human being whose conceptions were of governmental and global import, as one can easily see by reading his last article. He had planned to write on power engineering and ecology, on his concept of chemistry education (he even already had a title for that article—"Everything Starts From One's Studies"), and on plant safety in chemical and non-chemical enterprises, which was a topic of constant concern to him during his last years.

Now those materials can (will they?) give us his recorded chronicles only, which now must be analyzed and interpreted.

The massive efforts now being undertaken to renovate the country's industrial potential may turn out to be ineffective because of one missing link in the chain of planned operations. That link is concern about placing (or restoring) our domestic chemical industry on a level that is essential to our needs.

The comprehensive program for the development of the chemical industry provides for an increase in the manufacture of those substances and materials which are in particularly short supply today. But that approach will, for all of its obvious importance, still not eliminate our technological backwardness. One can "plug all the holes" and still lag behind in the scientific and technical revolution [NTR]. Incidentally, we have been accustomed to using this abbreviation to mean the scientific and technical revolution, but in accordance with world-wide realities we should give it another meaning—the scientific-technological revolution! For the absolute majority of NTR achievements (technical revolution) would have been impossible without radical changes in technology.

The comprehensive chemical industry program as it was envisaged several years ago did not deal with the role of chemical processes in the non-chemical industrial sectors. This role, however, has become a key element everywhere, be it in metallurgy or power engineering, computer technology or communication lines, transportation systems or environmental protection.

There are a great number of examples to support that view. I shall merely cite one example that is closest to me personally, although I am not sure that readers of KHIMIYA I ZHIZN do not already know about these figures and facts: Seventy-five percent of the operations performed in the fuel cycle of nuclear power generation are chemical operations. This includes the acid leaching of uranium-containing ores, the preparation of highly pure concentrates, the conversion of uranium compounds into a gas phase for isotope separation and the subsequent reduction of the gas to uranium or its oxides, the manufacture of essential materials and compounds for



the active zone of nuclear reactors, etc., all the way to the radiochemical refining of the finished nuclear fuel and the separation and burial of radioactive waste. Chemical processes and procedures are employed everywhere and in each stage.

If that were the situation in the nuclear power field only, then perhaps there would not be such an acute need to raise the question of establishing a rational and genuinely contemporary chemical development program. But it is necessary because the same situation applies to any energy-producing sector and even non-power generating sectors as well. That situation applies to an even greater degree to the fields of electronics, construction, and machine-building. In all of these sectors, just as in the chemical industry itself, there is an increasingly perceptible lack of fundamental chemical knowledge about the processes and materials being employed. Progress in the coal and gas industry, for example, is tied to the increasing need to utilize chemical forms for converting raw material that are more conveniently transported and exploited.

Or take another example that is on an even larger scale. We speak and write with increasing frequency about the need to utilize natural resources, including mineral resources, in a more comprehensive and maximally thorough manner. Everyone supports that notion, but those noble appeals for the most part remain just appeals. Journals are very quick to attribute this general calamity of ours to departmental red tape, the non-turnover of apparatus, etc., but fail to mention the main reason for this situation, and that is that fundamental chemistry is lagging behind the urgent demands of technology. The only way a comprehensive approach to natural resources can become a reality is through a new technological strategy that is supported by fundamental chemical research which, unfortunately, is very often lacking today. How many interesting and very promising ideas have we had that were at least theoretically possible and tested in laboratories, but nevertheless were never prepared to be tested on an industrial scale! They were not prepared because neither the authors nor any of us had a sufficiently detailed understanding of the processes that operate in chemically complex systems. Thus, the attempted commercial development of the Astrakhan gas field demonstrated the unpreparedness of the chemical science sector to resolve fundamental ecological tasks associated with the large-scale processing of this kind of raw resource. Again, this is but one example.

#### Priorities of Chemistry

The experience of previous generations and the experience gained by foreign colleagues can be applied to our present situation only up to certain limits. Still, it would be stupid not to consider that experience. In the USA, for example, intensified research on the chemical essence of processes and phenomena is seen as the one major pathway to further progress in all areas of engineering and technology.

With this purpose in mind, in 1982 the National Academy of Sciences and National Research Council of the USA commissioned committees consisting of 350 of the leading chemists of the country headed by Professor J. Pimental of the University of California to analyze the state of the chemical sciences and their intellectual and economic potential. This committee worked on its assignment for more than three years and published an expansive report over 1,000 pages in length titled "Analysis of Chemical Science Potential."

The principal conclusion of this analysis, which would do us no harm to heed, was the following: the next two decades will have to bring revolutionary changes in our fundamental chemistry knowledge and in our ability to use that knowledge to achieve the goals set by society.

What is meant by that? First of all, it means cardinal changes in technology—in all industrial sectors. Underlying these changes must be basic research as much as applied research. I emphasize, basic chemical research. In order to accomplish that goal the committee recommended that beginning in 1987 there should be a 20-25 percent increase in allocations for basic chemical research. Without such an effort, Pimental and his colleagues believe that the USA will not be able to retain its leading role in chemical technology in the face of the increasing competition from Japan and Western Europe.

No mention was made of us or our chemical sciences and technology among the principal competitors, and unfortunately, that reflects reality.

The decree of the CPSU Central Committee and the USSR Council of Ministers "On Accelerating the Development of Priority Areas in Chemistry and Technology" appeared later, and the first sentence of this decree stated: "The scope and level of basic and applied research in a whole series of chemical and industrial areas do not satisfy the requirements of the national economy." The decree further outlined and stipulated the most important areas of chemical research without whose serious revival the scientific and technical revolution would simply be impossible.

Included in such areas are new construction and functional organic and inorganic materials (polymer, composite, ceramic, and metallic materials, and elastomers and artificial and synthetic fibers) as well as methods for protecting them against wear and corrosion.

Those research areas also include chemical industry safety and environmental protection.

Also included is fine organic, inorganic, and heteroorganic synthesis whose purpose is to create new substances and materials (this point of the decree is followed by a rather impressively extensive enumeration, ending with the words "and other products manufactured by small-scale chemical plants").



But this is not an exhaustive enumeration of priority areas.

The following points of the decree deal with the high-efficiency chemical manufacturing processes, including catalytic, membrane, metallurgical, and electrochemical processes as well as processes associated with high-energy applications and the physical acceleration of chemical reactions;

new processes for the intensified and comprehensive chemical processing of mineral raw products, petroleum, gas, and solid fuels;

chemical power engineering and the creation of new chemical power sources and energy-conversion systems;

new methods for instrumental chemical analysis, chemical monitoring and diagnosis of chemical processes and properties of materials and manufactured products;

chemical information science.

There are hardly enough pages in the journal to illustrate the specifics of each of the above-mentioned paragraphs, so that I shall limit myself here to just one example, which is taken from an area that is well known to readers of recent issues of *KHIMIYA I ZHIZN*. The subject material is a familiar one, but the example, I expect, will surprise many.

Japanese specialists admit that the preeminence of their electronic products on the world market and the reliability and high quality of those products are primarily due to the achievements they have made in membrane technology in this area. Their achievements. In the exact same manner, the quality of our own electronic products, including home appliances, is so far behind not only the Japanese, but also European standards, because of our backwardness in the development of membrane materials and methods that are applicable to this demanding area.

#### What Kind of Materials Are Needed

Any kind of human endeavor, beginning with the production of food and ending with the launching of space rockets, is in one way or other tied to the consumption of materials. Without question, chemical processes underlie the production of all types of materials. The principal task of modern chemistry is to design and create new substances, preparations, and materials as well as to perfect materials already known to us. The component elements of modern chemistry include the synthesis of new substances and materials, the study of their properties, and the analysis of their behavior under various exploitation conditions. This area of chemistry is generally called chemical materials science. The efforts of chemists have resulted in the creation of such almost fantastic materials as organic metals, non-combustible paper, and blood substitutes, just to name a few. The

priority importance of materials science has been recognized by society as a whole and has been given legislative reinforcement in a number of state and intercountry documents and programs.

The replacement of the mass production of a specific, stable assortment of materials by the small-scale and rapidly updated production of a large number of manufactured items characterizes the present momentum of materials science and production. Chemical enterprises in all countries are today manufacturing products 50 percent of which, 20 years ago, did not exist at all. However, the development of new chemical products and materials requires considerable material expenditures. For example, 12-15 thousand substances or more are synthesized in order to find just one plant-protecting agent that is suitable for commercial production. In the USA, up to 450 theoretical projects are developed in the course of starting up the commercial production of each item. Of those 450 projects, 100 go through laboratory testing, and only ten of that number go into pilot production at commercial test plants, and no more than half that number finally become economically feasible. It is felt, however, that these few products more than compensate for the expenditures incurred for all the preliminary projects, and as a rule, this is the way it turns out. Therefore, there is nothing surprising in the fact that the funds spent on chemistry research in the industrial countries are, on the average, double the appropriations allotted to other areas of science and technology.

In the light of the astronomical expansion in the variety of materials, only basic research can enable us to develop the most economical strategy for creating new materials. In that connection, particular attention is given to scientific and technological studies of those materials which hold the greatest promise of being "germinators of new things," i.e., priorities are given to the field of chemistry. We have also taken that path, although with some delay. Let us now turn to specific materials and substances.

Metals and alloys will long retain their leading position among construction materials. Also retaining their importance in that connection are such areas of chemical activity as corrosion control, formulation of the physico-chemical principles of comprehensive alloying, the development of various surface treatment methods, including protective coatings, and a number of other areas that have already become traditional.

However, against the background of those developments it is essential to identify an area which promises to give rise to a completely new class of metallic materials with unprecedented hardness and electromagnetic and anti-corrosive properties, an area in which we have not yet become sufficiently active. I have in mind here the new areas in the manufacture of amorphous metallic materials, powder metallurgy, and the symbiosis of these technologies.

Even the situation in traditional powder metallurgy in our country is not satisfactory. Our volume of output of iron-based powders is several times less than that of the USA. The situation is even worse with respect to the quality of those powders. The contaminant content in our powders is seven times higher, and the powders do not meet granulometric uniformity requirements. We have not worked out processes for producing alloyed powders, and the variety of our powders lags far behind that of the West (about 30 brands, as opposed to 200). Many of these problems are connected with the insufficient utilization of advanced methods of metal dispersion and, in particular, the limited use of chemical methods.

The intensive research carried out abroad on amorphous metallic alloys has paved the way for the commercial production of such alloys, which will vigorously expand in scale. According to company plans, by the year 2000 that production will grow 100-fold and reach a production level of hundreds of thousands of tons. The annual economic savings in the USA from their application in the electrical engineering industry alone will come to about 400 million dollars as a result of lower energy losses to reversal of magnetization in power transformers and electric motors.

Until recently, there have been practical uses for iron family-based amorphous alloys (primarily in the electrical engineering industry). However, scientific and technological bases have already been created abroad for producing amorphous aluminum and magnesium light alloys which are of primary interest to aviation and space science.

Such amorphous alloys produced by superfast hardening are reprocessed into products of highly diversified shapes and purposes by powder metallurgy processes. The new area of metal materials technology is arising at the junction of these two areas. This mutually enriching symbiosis will make it possible to obtain non-equilibrium supersaturated alloys and composites that are inaccessible to any other technology and that possess elevated strength and anti-corrosion properties at high temperatures.

The role of chemical materials science in the development of this direction should be quite obvious: The study of processes involved in the transition of materials from the amorphous to crystalline state, especially in multi-component systems, methods for synthesizing powders, and the identification of the relationship between composition and the mechanical, corrosion, and electromagnetic properties—all are essentially chemical problems.

The importance of synthetic polymers hardly needs to be proven to readers of *KHIMIYA I ZHIZN*. But the fact remains that we are behind both the developed capitalist countries and the European socialist countries in the per capita production of plastics and synthetic resins (14.5

kg in our country, as opposed, for example, to 52 kg in Bulgaria and 62 kg in Czechoslovakia). Even if we fulfilled our assignments planned up to the year 2000, we would still be seriously behind the USA in volume of production of polymers.

Therefore, the first task in this area is not only to fulfill, but to overfulfill the goals of the Comprehensive Chemical Development Program with respect to the volume output of basic polymers, particularly polypropylene (whose production must increase several-fold), polystyrene, and synthetic rubber. Here, too, science and new technology must play a primary role. Thus, increasing the production of butadiene for the manufacture of rubber products is possible by reprocessing the excess ethylene which is now burned off at petrochemical combines. This can be done with the help of new highly effective catalytic processes. If we raise the performance of low-density polyethylene synthesis reactors by 20 percent, we shall be able to switch to polymerization initiators based on aliphatic acid peroxides.

Along with improvements in the production of traditional polymers, the chemical science sector must resolve a multiplicity of tasks dealing with the development of new polymers that have improved and fundamentally new properties.

One of the "hot spots" of today's polymer science involves multi-purpose polymer mixtures and alloys. The conversion of basic polymers into new materials through their efficient and scientifically substantiated mixing and alloying represents enormous and as yet little-utilized potentials in our country. The scope opened up by that prospect is comparable to the transition in metallurgy from individual metals to target-oriented alloys.

In many cases, high-quality physico-mechanical characteristics that are unobtainable for individual plastics can be combined in polymer mixes and alloys. The number of studies and projects under way in the area of polymer mixtures in the USA and other industrially developed countries has been growing in geometric proportions. Since 1970, there have been over 65,000 patents issued for polymer mixtures. The use of mixtures as construction materials for machine-building has been expanding in particular. The annual global increment in the output of those products has been 17 percent during the last five years (whereas the total increase in plastics production has been 3 percent per year). There is reason to believe that by the middle of the '90s, the use of individual polymers will be as rare as the use of individual metals is today.

By increasing the production of individual construction polymers—traditional and new ones—we still will not overcome our backwardness unless we become concerned (even today!) about the serious growth of basic scientific research and design projects based on a profound knowledge about the potential that polymer mixtures and alloys offer.

In essence, this is one more kind of composite material, to which several recent issues of *KHIMIYA I ZHIZN* were devoted. Therefore, we shall not dwell on composites as a separate topic. I shall only note that the development of hybrid materials in which polymers are combined into a unified structure with metals or ceramics at the molecular level has become an element of a new ideological and methodological approach in global chemical material science studies.

Ceramics constitute the third "whale" for our national economy and share the same importance as metallic and polymer materials. Until recently, progress in various industrial sectors has been connected to the so-called functional ceramic materials, i.e., ceramics with special magnetic, electrical, optical, thermal, and other properties. Now the "ceramic branch" of chemical materials science has essentially been oriented toward construction ceramic materials that exhibit exceptionally high mechanical strength at elevated temperatures.

The most important engineering task being resolved on the basis of this kind of ceramics is the building of ceramic gas turbine engines, diesel engines, and internal combustion engines for industrial and transportation purposes. Here ceramic materials promise the achievement of unprecedented parameters. However, this also requires "unprecedented" ceramics whose outstanding properties must be obtained not only in the laboratories, but also in industrial manufacturing processes.

Research programs carried out in the world have demonstrated that the working temperature in the combustion chamber of engines and the temperature at a turbine's inlet can be realistically raised to 1,200—1,370°C. This can yield an efficiency of 45 percent, and the engine would become "omnivorous" with respect to the fuel composition and would not require cooling systems for turbine blades or internal combustion engine cylinders; there would be a 35 percent savings of fuel as well as an increase in the ecological cleanliness of the engines with respect to exhausts and noise.

Ceramic materials can resolve more than one technical task, but as a new class of construction materials, ceramics have their own specific problems which require the participation of the chemical sciences. The first of those problems is to identify the interrelationship between the microstructure of ceramics and the nature of the development of mechanical stresses and the appearance and spread of micro fractures. Also exceptionally important are the new processes for producing raw materials of high purity for new ceramics (including superconductors) and reliable control over processes for creating optimal microstructure. A prominent role here is played by the control of chemical methods and the synthesis of chemical materials.

The tasks facing the chemical sciences in the area of material science are as varied as the very world of contemporary materials. Technology is developing very

rapidly. Consequently, it is difficult to predict with precision which specific materials will be needed in the immediate future. What is important is that without a fundamental scientific stockpile, the creation of such materials is unrealistic. That is why the development and needs of chemical materials science must be given incomparably more attention that has been the case up to now. That is why the creation of that stockpile represents one of the most important of all the priority areas in the development of chemistry and technology.

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### **Chemical Ministry Bureaucracy Delays Production of Polymer**

18410043b Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 1 Oct 88 p 2

[Article by V. Kotov, engineer, datelined Leningrad-Moscow: "Do We Have It or Not? What Is Delaying Production of Material of Future—Domestic Temple?"; first paragraph is a boldface SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] The tape recorder that used to store the voices of my partners in conversation went silent long ago. Again I attack the pile of documents, comparing what I have just heard with the correspondence. My conversation with A. Tsurikov, chief engineer of the Okhta Scientific-Production Association Plastpolimer, and M. Rozenberg, director of the association's scientific unit, pertains to the same thing—this so-called temple.

I am holding an almost weightless, tiny part in the palm of my hand. It is a left ventricle, and somewhere a calf is now living with one. Here is a syringe that that be sterilized to a temperature of up to 250 degrees. Here are samples of artificial arteries and vessels and more medical devices. And all this is absolutely harmless and compatible with tissues; a living organism does not reject temple!

Medicine and agriculture, aviation and communications, electronics and aeronautics, modern chemical engineering and consumer goods—this is hardly a complete list of the possible applications of this polymer. America's Union Carbide, Europe's Philips and BASF, Japanese chemical concerns, in other words, the leading Western companies, are increasing production of materials like temple and are gradually entering and winning the market.

At the same time, the Okhta Plastpolimer produces only a few tons a year, and with a pilot plant at that. Three propane carriers wind their way thousands of kilometers to Sumgait and back. And besides the distance, they have a 300 percent overhead to feed the low-capacity, half-dilapidated plant at "Plastpolimer" because there is nowhere in Leningrad to store the raw material, propylene.



Doctors need templene like they need air! Membrane gas distribution elements for Gornyy klimat [Mountain Climate] treatment chambers being developed and tested under the aegis of the Ukrainian SSR Academy of Sciences are made from it. Only one of these chambers exists, but the country needs 200 to 300 of them. So the First Deputy Minister of the Chemical Industry, A. Ustachkintsev, decides to buy Japanese templene. But a serviceable plant could be built on the Okhta for just a portion of the foreign currency spent on the purchase!

Oh, how well I understand and support Tsurikov and Rozenberg. There are not enough funds, but they did not dismantle the plant or the laboratory. Domestic templene was born and baptized in the Okhta. The Ministry of the Chemical Industry allocated 400,000 rubles, but they went mainly to rebuild the plant. It agreed to help by manufacturing two new reactors to replace those that had broken down and had been barred from operation by the Izhora Plant's Kotlonadzor [Boiler Inspection Service]. There was almost nothing left to operate. As a result, at the end of the year all that was left was just 2 tons of templene.

The USSR Ministry of the Chemical Industry cannot give more money! But why only this ministry? Where are the real end users—the ministries of the health, electronics, and aviation industries, etc.? What is simpler for them—to push a pile of paper and spend foreign currency or to offer direct financing of work to develop domestic templene?

I rearrange the paper mosaic and catch myself in the thought that this is an old story. The same thing happened with computers, lifting cranes, and subsoil tillage—yet we developed these all ourselves. But where has all of this been embodied in specific goods? Well...

I turn on the tape recorder and hear the chief engineer's voice. "Today the situation is such that what is good for the government is bad for the enterprise. The numbers prove it. But who said that the Okhta 'Plastpolimer' is not part of the government? The idea that the country needs templene is nothing new. What is new is why is the state's approach to the problem has been limited to the territory and the financial capabilities of one enterprise?"

Recently a unique concern was formed in Leningrad—the State Interbranch Production Association "Tekhnokhim." The association includes "Plastpolimer," which had been removed from the Ministry of the Chemical Industry jurisdiction.

Independence, yes! But use it wisely! Who, if not the Okhta specialists, should understand that real industrial production can only be set up where the raw material is

produced. The most appropriate place is Kazan's production association "Orgsintez." It has everything needed for setting up templene production: raw material, production space, and the equipment required. The only thing that remains is to find a common language for Leningrad and Kazan.

But habit is delaying things. They are waiting for instructions from the ministry. The picture is familiar, ever since the days when every maneuver from "below" was seen from "above" as a challenge.

But in this specific situation? The USSR Ministry of the Chemical Industry decided to develop a large 10,000-ton/year templene production facility. "Plastpolimer" knows this for sure. That is where the technical documentation for the project originated. The estimated completion date is sometime during the 13th Five-Year Plan.

Here is what happens. On the one hand, 300 tons of templene, the near-term demand, lies hidden at "Plastpolimer" in science and suspended in a moneyless vacuum while the association stands as a beggar. On the other hand, there is the Ministry of the Chemical Industry, which is working on solving the global problem of producing 10,000 tons of product per year by developing modern industrial production facilities.

In an interview with the large-circulation newspaper ZNAMYA TRUDA, I. Konoval, 19th Party Conference delegate and general director of "Plastpolimer," said, "The idea of restructuring as social revolution entails changing the old order, i.e., transferring key management functions, rights, and powers from the ministry to the enterprise and from the apparatus to the collective. This means one thing—a definite severing of old relationships and a struggle for one's own rights."

The general director was right! Only something was missing—the people at Okhta are looking for partners, signing contracts, and managing to set up templene production at other enterprises as well. Apparently talk is easier...

We are sitting in the laboratory of Vladimir Filimonovich Vasilenko, a likable, ironic person. It is he and his colleagues who began the fight for Soviet templene by making calculations on paper and performing laboratory experiments. He is still a child. If there is no equipment, bring it from the dump and make it work. If it does not exist in nature, invent it and make it. His home personal computer even gets into the act—into the act for action's sake.

Today there is templene, today there is no templene.

That is how the mosaic has turned out.



**Interaction of Diammonium Phosphate and Potassium Chloride Mixtures With Active Radicals of Heptane Flame**

18410371a Moscow KINETIKA I KATALIZ in Russian Vol 29 No 3, May-Jun 88 (manuscript received 24 Oct 86) pp 524-525

[Article by A. G. Tropinov, V. M. Zhartovskiy, A. V. Antonov, and A. N. Baratov, All-Union Scientific Research Institute of Fire Protection, Kiev Branch]

[Abstract] Described and discussed are optical spectroscopy changes in the intensity of OH radical emission after introduction, into the burner, of mixtures containing different amounts of KCl and  $(\text{NH}_4)_2\text{HPO}_4$ . The inhibiting effect of the mixture was less than that produced by individual salts. The effect of the antagonism was attributed to a shift of the potassium into a less reactive form with formation of potassium phosphate. The appearance of antagonism of inhibition when a mixture of powders is used as an extinguisher should be considered when the components for new fire-fighting powders are selected. Figures 3; references 14: 11 Russian; 3 Western.

UDC 54541.128.3:541.124-145.4:542.952.6:547.538:491.3:546.33

**Catalysis of Combined Reactions of Urethanes, Allophanates, and Isocyanurates by Sodium Compounds**

18410371b Moscow KINETIKA I KATALIZ in Russian Vol 29, No 3, May-Jun 88 (manuscript received 30 Mar 87) pp 547-552

[Article by I. V. Pisareva, L. A. Bakalo, and V. P. Gritsenko, Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] This article reports a comparative study of the kinetic mechanism of reaction of a phenylisocyanate polycompound in solvents having different polarities and solvating capacities in the presence of some sodium compounds with anions having a pronounced nucleophilicity. Infrared spectroscopy revealed changes in both the isocyanate and all products formed during the reaction. Experimental demonstrations of two pathways of the reaction were presented. One involved unbroken anionic cyclotrimerization of phenylisocyanate. The other involved anionic polymerization of phenylisocyanate with a break at apposite proton donors. Figures 2; references 13: 2 Russian; 11 Western.

UDC 541.183+138.2

**Adsorption and Electrooxidation of Barbiturates on Platinum Electrode**

18410347a Moscow ELEKTROKHIMIYA in Russian Vol 24, No 6, Jun 88 (manuscript received 14 Dec 86) pp 776-780

[Article by V. A. Grinberg, Yu. B. Vasilyev, and Ye. K. Tuseyeva, Electrochemistry Institute imeni A. N. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] The problem of electrochemical detoxification of the body after poisonings by barbiturates prompted this study of the basic mechanisms of adsorption and electrooxidation of barbituric acid, sodium ethaminal, hexenal, phenobarbital, and sodium pentothal on a platinized platinum electrode. All of the barbiturates studied displayed stable chemisorption on the platinum electrode, which leads to a reduction in hydrogen absorption on the electrode. Adsorbability of the barbiturates increased in the sequence sodium ethaminal < hexenal < phenobarbital < sodium pentothal, and the rate of oxidation decreased in this sequence. Direct electrooxidation proved to be effective for detoxification after hexenal and sodium ethaminal poisonings but was ineffective after phenobarbital and, especially, sodium pentothal poisoning. Oxidation with the use of sodium hypochlorite as an active oxygen carrier was effective after hexenal and somewhat effective after phenobarbital poisoning. In view of the high chemisorption of sodium pentothal, phenobarbital, and hexenal on platinum, carbon hemsorbents promoted by platinum may be used to remove these compounds from blood and other biological fluids. Figures 6; references 11: 8 Russian; 3 Western.

UDC 541.135.4

**New Concept of Membrane Equilibrium and Anomalous Potentials During Conjugated Ion Transport**

18410347a Moscow ELEKTROKHIMIYA in Russian Vol 24 No 6, Jun 88 (manuscript received 8 Jul 87) pp 781-787

[Article by V. S. Markin and V. S. Sokolov, Electrochemistry Institute imeni A. M. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] A generalized concept of membrane equilibrium based on the condition of ion transport interruption showed that in the case of an electrogenic conjugated transport membrane equilibrium may occur without Donnan equilibrium, in which case the membrane potential may have an anomalous value and sign. Nernst-Donnan equilibrium does not contradict the new concept but is instead considered to be a particular case in which the transport of ions penetrating the membrane stops when their electrochemical potentials in the solution become equal. Such equilibrium must occur if the ions penetrate the membrane independently of one another, making both conditions of equilibrium—ion transport interruption

and the equality of the electrochemical potentials of the ions in the solutions—equivalent. In more complex forms of ion transport in which several types of ions are conjugately transported through the membrane, ion transport may be interrupted without equality of the relevant electrochemical potentials in the solutions. When this is the case, an anomalous potential that does not satisfy the Nernst formula forms on the membrane. This concept sheds new light on the role of electrogenic conjugated ion transport in regulating membrane potential. Figures 3; references 16: 5 Russian; 11 Western.

UDC 541.135.4

**Study of Electrical Conductivity of Heterogeneous Ion-selective Membranes in Concentrated Sodium Chloride Solutions**

18410347c Moscow ELEKTROKHIMIYA in Russian Vol 24 No 6, Jun 88 (manuscript received 21 Feb 85, revised manuscript received 22 Jul 87) pp 807-810

[Article by Z.V. Klimova, G.K. Saldadze and G.Z. Nefedova, Moscow]

[Abstract] A study of the change in the electrical conductivity of membranes as a function of the concentration of an equilibrium of sodium chloride solution was described and discussed, and conditions of preparing membranes for testing were described. Heterogeneous membranes, MK-40 and MA-40, were studied. Electrical resistance of the membranes was determined by a differential method in a cell with platinized platinum electrodes with alternating current at 1000 Hz. Membranes were prepared for testing by direct or sequential saturation of samples in sodium chloride of the required concentration. Higher electrical conductivity of the membranes after sequential saturation of them was due to the higher coefficients of moisture capacity of the membranes due to the presence of more current carriers in them. Optimal values of coefficients of the cationite membrane MK-40 were 11.5-12.0 and those of the anionite membrane MA-40 were 7.0 to 7.5 mg-mole of H<sub>2</sub>O/mg-mole. At these values of moisture content coefficients, the optimal distribution of ionogenic groups in the membrane matrix is ensured, and the maximal specific electrical conductivity of the membranes is achieved. Figures 3; references 7: 6 Russian; 1 Western.

UDC 541.138

**Electrocatalytic Properties of Highly Dispersed Tungsten Carbide in Water Electrolysis With Solid Polymer Electrolyte**

18410376d Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 54 No 7, Jul 88 (manuscript received 22 Jan 87) pp 709-713

[Article by O. V. Archakov, Ye. K. Lyutikova, V. N. Fateyev, Kh. B. Kushkhov, and V. I. Shapoval, Atomic Energy Institute, Moscow]

[Abstract] A study examined the electrocatalytic properties of highly dispersed tungsten carbide (WC) powders (produced by high-temperature electrochemical synthesis) in

contact with a solid polymer electrolyte, and the possibility of their use as cathodic material in solid polymer electrolyte systems was assessed. The catalytic activity of WC in solid polymer electrolyte system was slightly dependent on the specific surface and the stoichiometric composition. Use of composites based on WC and solid polymer electrolytes increased cathode activity due to an increase in the surface of the three-phase electrolyte-electrode-water interface. The high corrosion resistance of WC justifies its recommendation for use as a cathode catalyzer in systems with a solid polymer electrolyte at current density up to 100 mA/cm<sup>2</sup>. Figures 2; references 11; 6 Russian; 5 Western.

UDC 678.073:621.794.44+546.222'56

**System Impact Resistant Polystyrene and Electroconducting Sulfide Coating. 2. Effect of Treatment on Morphology and Adhesive Properties of the Surface**

18410378b Vilnius TRUDY AKADEMII NAUK  
LITOVSKOY: SERIYA B in Russian  
Vol 2, Feb-Mar 88 (manuscript received 13 May 87)  
pp 7-13

[Article by L. L. Narushyavichyus, G. I. Rozovski, Y. Y. Vinkyavichyus, and F. P. Frolova, Institute of Chemistry and Chemical Technology, LiSSR Academy of Sciences]

[Abstract] Samples (50x20x1.5 mm) were taken from type UPM-0703 E impact-resistant polystyrene by pressing under a pressure of  $0.5 \times 10^6$  Pa at 220°C and heating for 1 minute. The plates were treated at 20°C, first in chromate solutions and then, after washing in water, in a xylol emulsion. Adhesion of a Cu<sub>2</sub>x coating to the impact resistant-polystyrene (which was obtained by treating the polystyrene for 10 seconds at 20°C and then by a 5- to 180-second treatment with the xylol emulsions at 20°C) was caused by physicochemical factors and not by locking adhesion. Treatment of the impact-resistant polystyrene in the xylol emulsion affected its adhesion properties but did not change the surface morphology. After treatment of the impact-resistant polystyrene in the xylol emulsions, rubber globules appeared, through which the interphase impact-resistant polystyrene-coating bond was realized. Figures 3; references 8; 6 Russian; 2 Western.

UDC 621.793.3

**Structure of Ni-P and Ni-P-Cu Coatings Deposited by Hypophosphite**

18410378c Vilnius TRUDY AKADEMII NAUK  
LITOVSKOY SSR: SERIYA B in Russian  
Vol 2, Feb-Mar 88 (manuscript received 14 Jul 86)  
pp 14-21

[Article by I. I. Zhitkyavichyute and R. K. Tarozayte, Institute of Chemistry and Chemical Technology, LiSSR Academy of Sciences]

[Abstract] The structure of Ni-P and Ni-P-Cu coatings produced in acid and alkaline glycine-containing solutions was described and discussed, and their connection

with features of the deposition process was discussed. Fine-crystalline Ni-P coatings were deposited in a slightly acid medium (pH=5.5) and large-crystalline coatings were deposited in an alkaline medium (pH=9) in glycine-containing nickel plating solutions by using hypophosphite. The addition of Cu(II) to slightly acid chemical plating solutions helped to form a smooth finer structure and reduced the size of crystals in alkaline solutions. The reduction in the size of crystals and finer structure of Ni-P-Cu coatings were attributed to inhibition of the free growth of Ni upon adsorption and reduction of Cu on the growing Ni planes, possibly in the form of its compounds. The Cu layer was more pronounced in the acid medium when its percent content in the coatings was higher. Figures 5; references 5; 3 Russian; 2 Western.

UDC 547.52+547.553+51.427

**Relative Reactivity of Aromatic Diamines in Reactions of Polyaminoacid Formation**

18410379b Minsk DOKLADY AKADEMII NAUK  
BSSR in Russian Vol 32 No 8, Aug 88 (manuscript received 21 Dec 87) pp 726-728

[Article by A. I. Volozhin, E. T. Krutko, A. A. Rozmyslova, and Ya. M. Paushkin, academician, BSSR Academy of Sciences, Institute of Physico-organic Chemistry, BSSR Academy of Sciences]

[Abstract] This article presents and discusses the results of a determination of the relative reactivity of some aromatic diamines having different chemical structures during their interaction with dianhydrides of pyromellitic acid. The determinations were made by using the thermochemical method. Acylation enthalpies of aromatic diamines with dianhydrides of pyromellitic acid were determined. The study revealed the effect of the chemical and steric structure of the diamines on their relative reactivity during interaction with dianhydride of pyromellitic acid, which predetermines the use of the more reactive of them during polyamino acid synthesis. Figure 1; references 5 (Russian).

UDC 54541.135.5

**Processes of Electron Transfer Through Alloyed Passive Films**

18410379c Minsk DOKLADY AKADEMII NAUK  
BSSR in Russian Vol 32 No 8, Aug 88 (manuscript received 25 Nov 87) pp 729-732

[Article by I. M. Zharskiy, A. Ye. Pochtenny, and A. O. Slesarenko, Belorussian Technological Institute imeni S. M. Kirov]

[Abstract] A study of electron transfer reactions through platinum-alloyed titanium passive films showed rather convincingly that electron transfer in alloyed passive films at low levels of alloying is realized by tunnelling through the admixtures. Increasing the alloying mixture dose produced a transition to metal type conductivity. Figures 2; references 11; 5 Russian; 6 Western.



**Environmental Pollution in Nonferrous Metallurgy**  
*18410038a Moscow SOTSIALISTICHESKAYA*  
*INDUSTRIYA in Russian 28 Sep 88 p 1*

[Article by P. Zakharov and D. Kharitonov, inspectors, USSR Committee of People's Control: "Breathe Through The Report"]

[Text] If we are to believe the accounts and reports, then last year the USSR Ministry of Nonferrous Metallurgy [Mintsvetmet] managed to achieve quite reassuring results in its environmental protection efforts. It fulfilled its plan task: regarding the abatement of air pollution and reduced the discharge of polluted effluents. But in its on-site checks of the situation the USSR Committee of People's Control [USSR KNK] discovered a depressing picture.

Here are just a few facts. In 15 out of our country's 50 cities with the worst air pollution, the main polluters of the environment turned out to be enterprises of the Mintsvetmet. For example, last year more than 6 million tons of various pollutants were discharged into the atmosphere of these cities. Both large and small rivers suffered heavily. Hundreds of millions of cubic meters of polluted industrial effluents were discharged into these rivers, 200 million cubic meters of which were completely untreated.

The ecological situation in a number of cities is simply disastrous. For example, the air in a radius of up to 20 kilometers around the Krasnoyarsk Aluminum Plant is polluted to such an extent that it is dangerous to breathe. In fact, with the connivance of the ministry the plant still does not have approved norms for permissible emission limits, which should have been developed 3 years ago. Last year's plan for an environmental protection measure simply remained on paper.

Dirty clouds—emissions from the Irkutsk Aluminum Plant—hover over the city of Shelekhov. In one year they absorb more than 50 thousand tons of harmful substances. The emissions from the Bratsk Aluminum Plant also present a real hazard for its inhabitants and the environment. According to the figures from the Irkutsk Forestry Office, the total area of "sick" and dead forests in the gas-affected zone of the Bratsk industrial region has surpassed 80 thousand hectares.

The construction of pollution control devices at the Novokuznetsk Aluminum Plant also gives no rise to optimism. There, 9 of 16 planned gas-scrubbing units have not been placed in service, although all the deadlines expired 8 years ago. But last year and this year the ministry did not allocate even 1 kopeck for the construction of gas scrubbers.

The USSR committee of People's Control has found that the process of restructuring the style of management has been slow at the USSR Mintsvetmet. Enjoying the lack

of control, the management fails to carry out the decisions of the party and the government regarding the problems of environmental protection.

**Environmental and Health Protection in Aral Sea Basin**

*18410038b Moscow SOTSIALISTICHESKAYA*  
*INDUSTRIYA in Russian 30 Sep 88 p 1*

[Anonymous article: "In CPSU Central Committee and USSR Council of Ministers"; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] The CPSU Central Committee and the USSR Council of Ministers have adopted a resolution entitled "Measures for Fundamental Improvement of the Ecology and Pollution Situation in the Aral Sea Region and for Increasing the Effectiveness of the Utilization and Conservation of Water and Soil Resources in Its Basin."

The resolution notes that the large-scale water management and land reclamation work being carried out in the Aral Sea and the Amu-Darya and Syr-Darya river basins has made it possible to create large agricultural complexes producing cotton, rice, and other crops in the region. The agricultural production in this region was quadrupled from the 1950 level.

At the same time, the councils of ministers of the Uzbek, Kazakh, Kirgiz, Tadzhik, and Turkmen republics, the USSR Gosplan, the USSR Minvudkhov [Ministry of Land Improvement and Water Management], and the all-union and republic authorities in charge of agriculture admitted serious shortcomings in the utilization of water and soil resources of the Aral Sea Basin, in the supply of high-quality drinking water to the public, and in the construction of modern sewage and runoff treatment systems in cities and other populated areas. For a long time, the main thrust was placed on placing new areas of irrigated land into cultivation without giving due consideration to ecological and social consequences.

Timely and effective measures for the prevention of harmful changes in the ecology and in air and water quality in the Aral Sea region due to the growing, nonrecyclable use of water for irrigation and excessive lowering of the level and shrinking surface area of this reservoir, which has an important effect on the climate and ecology, were not developed and implemented. Haphazard, low-quality construction of irrigation systems was tolerated. Repairs and modernization of irrigation systems and the construction and reconstruction of water collection and drainage networks in kolkhozes, sovkhozes, and other agricultural enterprises were carried out in grossly insufficient volumes.

As a result, very acute ecological and sanitary and epidemiological conditions had arisen in the Aral region (the Karakalpak ASSR, the Khorezm oblast of the Uzbek SSR, the Kzyl-Orda oblast of the Kazakh SSR, and the Tashauz oblast of the Turkmen SSR. In recent years,



there has been a sharp drop in the flow of water from the Amu-Darya and Syr-Darya rivers to the Aral Sea, the level of which fell by 13 meters and the surface area to two-thirds of the 1960 area. The sea has completely lost its significance to commercial fishery. The water quality of the lower stretches of the Amu-Darya and Syr-Darya rivers deteriorated to an impermissible degree. The rivers became of little value as sources of drinking water for the population. A rapid drying and salination of the soil in the deltas of these rivers, a great deterioration of the ecological systems, and climate changes in the region of the Aral Sea and in the adjacent areas are occurring, and many species of animals and plants are disappearing. Hundreds of thousands of hectares of irrigated land in central Asia became water-logged and saline. The fertility of the soils in many irrigated areas is decreasing.

The councils of ministers of the Uzbek, Kazakh, and Turkmen republics and the USSR Minzdrav [Ministry of Health] do not give sufficient attention to the development of health protection in the Karakalpak ASSR and the Khorezm oblast of the Uzbek SSR, the Kzyl-Orda oblast of the Kazakh SSR, and the Tashauz oblast of the Turkmen SSR, where an increase in the morbidity rate has been observed. The condition of medical facilities is unsatisfactory. Many cities and other populated areas do not have city water and sewers.

The 1986 decisions of the party and the government regarding the acceleration of the economic and social development of the Karakalpak ASSR and of the Kzyl-Orda oblast of the Kazakh SSR are not being carried out satisfactorily.

Assigning a great sociopolitical and national economic importance to a fundamental improvement in ecological conditions and the health of the population, creation of good working and living conditions for people living in the regions adjacent to the Aral Sea, and further development of production facilities in the Aral Sea basin, the CPSU Central Committee and The USSR Council of Ministers directed the central committees of the Communist Party and the councils of ministers of the Uzbek, Kazakh, Kirgiz, Tadzhik, and Turkmen republics, the USSR Gosplan, the USSR Minzdrav, and other ministries and departments to put in force between the years 1988 and 2000 a set of radical measures aimed at improvement in the ecology, supply of drinking water, and health services in the Karakalpak ASSR and in the Khorezm, Kzyl-Orda, and Tashauz oblasts, strict conservation of water resources in the Aral Sea basin, improvement of the hydrological conditions and ecological state of this sea and areas adjacent to it, and restoration of the flora and fauna.

In order to restore the disrupted ecological equilibrium in the Aral region, to preserve the Aral Sea (with its smaller area) as a natural object, which has a considerable effect on the conditions of the natural surroundings and climatic conditions in the regions, and to improve the sanitary and epidemiological conditions, it was

deemed necessary to establish a guaranteed flow of river waters to the Amu-Darya and Syr-Darya deltas and to the Aral Sea at a rate of at least 8.7 cubic kilometers a year starting in 1990 and to increase it to 11 cubic kilometers in 1995, to 15 to 17 cubic kilometers by the year 2000, and to 20 to 21 cubic kilometers by the year 2005 (including the collector and drainage water).

The USSR Minvodkhoz together with the USSR State Agroindustrial Committee [Gosagroprom], the USSR Academy of Sciences, the All Union Academy of Agricultural Sciences of the Order of Lenin imeni V.I. Lenin [VASKhNIL], and the affected ministries, departments of the USSR, and councils of ministers of the union republics were directed to develop and present for approval in 1990 to the USSR Gosplan and the USSR Goskompriroda [as transliterated] a comprehensive plan for the utilization and conservation of water and soil resources of the Aral Sea basin up to the year 2010.

The USSR Gosplan, the USSR Gosagroprom, and the USSR Minvodkhoz were directed to determine the quantity of water that must flow annually to the Aral Sea and on this basis to press the councils of ministers of the respective republics to observe their water use quotas from the Amu-Darya and Syr-Darya watersheds for irrigation and household needs.

The council of ministers of the Uzbek, Kazakh, Kirgiz, Tadzhik, and Turkmen republics, the USSR Gosplan, the USSR Gosagroprom, the USSR Minvodkhoz, and the ministries and departments that have enterprises and organizations situated in the union republics of central Asia and southern regions of the Kazakh SSR were assigned the following tasks:

to complete (between 1988 and the year 2000) a comprehensive modernization of irrigation systems over an area of 3.2 to 3.3 million hectares, to construct and rehabilitate a collector and drainage network over an area of 1.7 to 1.8 million hectares in the union republics of central Asia and southern regions of the Kazakh SSR, and to rehabilitate between 1989 and 1995 the main irrigation canals in the Karakalpak ASSR;

to implement water conservation technologies in irrigating agricultural crops, to see that the republic and local council and management agencies carry out purposeful organizational and practical work aimed at observance of water use quotas by every water user, to intensify the struggle with the inefficient use of water, and to reduce the water usage per hectare of irrigated land by not less than 15 percent during the current five-year-plan and by 25 percent by the year 2000;

and to implement in newly commissioned and modernized industrial production facilities mainly those processes that use no water or little water and systems that use circulating water or recycle treated waste water.

It was deemed appropriate to reduce by 160 to 170 thousand hectares the area of irrigated land that is to be placed in production between 1988 and 1990 in the Uzbek SSR, the Kzyl-Orda and Chimkent oblasts of the Kazakh SSR, and the Kirgiz, Tadzhik, and Turkmen republics, the cultivation of which is to use the water resources of the Aral Sea basin, and, starting from 1991, to suspend the construction of large irrigation systems and to halt the cultivation of new areas of land irrigated with water from the Amu-Darya and Syr-Darya rivers in the Aral Sea basins.

It was decided that further growth of agricultural production in the regions of the Uzbek, Kazakh, Kirgiz, Tadzhik, and Turkmen republics that use the water resources of the Aral Sea basin should occur chiefly on account of increased efficiency of utilization of existing irrigated land and natural pastures, systematic improvement and increase in fertility of soils, improvement of the structure of planting areas, and widespread utilization of scientific farming.

It was decided to increase the role of the basin's Syr-Darya and Amu-Darya water management associations of the USSR Minvodkhoz in the distribution of water resources among the republics and the industry branches, to which end the water management facilities on the Amu-Darya and Syr-Darya rivers and on their main tributaries, which have a considerable effect on the flow of these rivers, are being transferred to the jurisdiction of these associations.

The USSR Gosagroprom, the USSR Minvodkhoz, and the councils of ministers of the Uzbek, Kazakh, Kirgiz, Tadzhik, and Turkmen republics were directed to ensure a strict accounting of the use of water and irrigated land in the Aral Sea basin.

The USSR State Committee for Forestry [Goskomles], the USSR Gosagroprom, the USSR Minvodkhoz, and the councils of ministers of the Uzbek and Kazakh republics were directed to work jointly with the USSR Academy of Sciences and the Academies of Sciences of the Uzbek and Kazakh republics from 1988 to 1990 to carry out scientific research, design and exploration, and pilot industrial work aimed at stabilizing the soils and preventing the removal of salts and dust from the dried bottom of the Aral Sea and to implement (between 1991 and the year 2000) broad measures to stabilize the soil and establish plant cover in these areas.

The USSR Minvodkhoz was directed to develop (in 1988 and 1989) technical and economic foundations for the establishment of artificially regulated reservoirs in the region of the city of Muynak in the Karakalpak ASSR and in the region of the city of Aralsk in the Kzyl-Orda oblast and to perform technical and economic calculations for the construction of facilities to regulate the level and the flow rate of the shallow areas of the Aral Sea in the regions of the Amu-Darya and Syr-Darya deltas.

The decision emphasizes that improvement of the sanitary and epidemiological conditions in the Aral Sea region and protection and improvement of the health of the Soviet people living here is a task of tremendous political and social significance. These problems must be solved with utmost speed.

The USSR Minzdrav and the councils of ministers of the Uzbek, Kazakh, and Turkmen republics were directed to send to the Aral-Lake region a necessary number of teams of highly skilled medical workers in order to carry out in 1988 and 1989 general clinical examinations for the population and to provide first-aid services. They were also charged with the development and adoption in two months of a program aimed at lowering the frequency of illnesses and improvement of health of the population of the Karakalpak ASSR and of the Khorezm, Kzyl-Orda, and Tashauz oblasts between 1988 and 1998, as well as with the construction of necessary medical facilities between 1988 and 1995.

The USSR Gosagroprom, the USSR Minvodkhoz, the USSR Minneftegazstroy [as transliterated], the USSR Mingazprom [Ministry of Gas Industry], the USSR Minnefteprom [Ministry of Petroleum Industry], and the councils of ministers of the Uzbek, Kazakh, and Turkmen republics were directed to accomplish the following tasks in the Karakalpak ASSR and in the Khorezm, Kzyl-Orda, and Tashauz oblasts between 1988 and 1998:

construction and modernization of water supply facilities for agriculture; water supply, sewage, and treatment facilities for cities, city-type settlements, and rayon centers; and collecting mains for the removal of mineralized drainage water from irrigated land;

bringing the existing water supply and sewage facilities and networks up to a proper sanitary and technical order;

and, starting in 1988, delivery to the population of high-quality drinking water until the water supply sources are brought up to a proper sanitary and technical order.

The USSR Mingeo [as transliterated] was directed to intensify the search for new sources of underground fresh water in the Aral Sea region.

The USSR Minzdrav, the VTsSPS [All-Union Central Soviet of Trade Unions], and the councils of ministers of the Uzbek, Kazakh, and Turkmen republics were directed to intensify their efforts in the area of health education for the population and promotion of healthy life-styles and to include in the republic "Health" programs appropriate measures to prevent illness and reduce the frequency of illness.

The USSR Gosplan, the USSR State Committee on Science and Technology of the USSR Council of Ministers [GKNT], the USSR Gosagroprom, the USSR Academy of Sciences, the VASKhNIL, and the councils of

ministers of the Uzbek, Kazakh, Kirgiz, Tadzhik, and Turkmen republics were directed to take into account the measures specified in the present decision that aim at fundamentally improving the ecological and sanitary conditions in the Aral Sea region in their efforts to define more precisely the "Comprehensive Program for the Development of Production Capacity of the Central-Asia Republics and Kazakhstan up to the Year 2010".

In order to further increase the production capacity in the Aral Lake region, the USSR Gosplan, the USSR ministries and departments, and the councils of ministers of the Uzbek, Kazakh, and Turkmen republics were directed to develop and locate in the Karakalpak ASSR and in the Khorezm, Kzyl-Orda, and Tashauz oblasts production facilities that will increase employment and improve the conservation of water resources.

The USSR Academy of Sciences, the USSR Goskompriroda, the USSR USSR Committee for Hydrometeorology and Environmental Control [Goskomgidromet] and the academies of sciences of the Uzbek, Kazakh, and Turkmen republics were directed to organize, starting in 1989, a thorough study of the changes in the environment and climate in the Aral Sea region and to prepare appropriate proposals for consideration in the development of plans for economic and social development.

It was deemed appropriate to establish a USSR Academy of Sciences institute for ecology and water problems of the Aral Sea basin in the city of Nukus in the Karakalpak ASSR for making comprehensive studies of ecological problems of the use of natural resources in this region and for coordinating the activities of the scientific research organizations of the central Asian union republics and the Kazakh SSR in this area.

It was decided to place the agricultural production in the Aral Sea basin on rigorous scientific foundations that include optimization of the development of the industry branches, elimination of the single-crop practice of growing cotton and rice, elimination of degradation of the soil, and creation of a strong fodder base for an intensive development of animal husbandry. This requires development and implementation of zonewise soil and water conservation and resource conservation systems for use in agricultural management.

A number of organizational measures aimed at financing and rapid completion of work mandated by the resolution were adopted.

The USSR Committee of People's was directed to regularly monitor the execution of the tasks mandated by the decision.

#### **Informal Volgograd Environmental Group Controversy**

18410043c Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 9 Oct 88 p 2

[Article by I. Mordvinets, SOTSIALISTICHESKAYA INDUSTRIYA staff correspondent, datelined Volgograd: "We All Breathe the Same Air"; first paragraph is a SOTSIALISTICHESKAYA INDUSTRIYA boldface introduction]

[Text] The birth of the informal club Ekologiya in Volgograd was marked by an illegal meeting and then by an illegal demonstration to protect the environment. The cause is a serious one. But the day they picked, February 2, was the 45th anniversary of the victory at Stalingrad. This clearly offended many. Some jokingly and others seriously began to call them extremists who should be broken up in short order. The recommendation of the local press was in approximately the same spirit.

These attacks provoked a burst of indignation among the "informals." They literally buried the local editors with protests. But instead of being printed they were only quoted in wordy journalistic commentaries—and naturally not to the benefit of Ekologiya. The "Interim Regulations for the Organization and Conduct of Meetings, Street Processions, Demonstrations, and Other Measures in Volgograd" approved by the gorispolkom arrived just in time. These regulations came 6 months earlier than a similar all-union document, but they were stricter. Club activists were unable to get permission for a meeting. The "informals" complain also about the militia's increased interest in them: "Are we really some sort of conspirators or lawbreakers?"

Not all such statements can be taken as truth. The people in Ekologiya are a motley group. They range from "freelance" photographer T. Lebedev, who provides topical photos on nature preservation themes, which are displayed at the Fiftieth Anniversary of October movie theater, to V. Ovchinnikov, general director of the "Kaustik" Association, which builds bazudine production facilities. Each expresses himself in terms of his expertise. For example, some talk as if the West had intentionally sold us bazudine technology to poison the Russian people. Of course, no one takes these opinions seriously. But even claims that are groundless, if not laughable, are entirely capable of "stirring up the public."

I talk, for example, with a member of the club's board, steel wire and rope plant worker V. Glushkov. He shows me a letter with a demand to ban bazudine, for which the "informals" have gathered more than 17,000 signatures. I say, "I am also ready to join. But first prove why a new industry that has not appeared yet should die."



Instead of an answer, Vasilii Ivanovich holds out one more document. This is a horrible description of the symptoms that should accompany bazudine poisoning. But, you see, no one is ready to eat it with a spoon or spread it on bread.

And what is the point of Ekologiya's often used argument that bazudine and the products used to produce it are carcinogens? It sounds threatening, but let's not panic. You see, thousands of substances around us, starting with ordinary coal, have a similar property. Whether we like it or not, we have to trust the specialists. What do they think? These particular questions were posed at a meeting between workers in Krasnoarmeyskiy rayon and executives of several ministries that was organized by the Party obkom and gorkom. But the specialists were not heard. Here is the evidence of one of the meeting participants, P. Slyshnik, mechanics' brigade leader at the Kaustik Production Association.

"By the appointed hour people had filed into the Khimik Palace of Culture. The hall quickly filled to capacity, but the flow kept coming. Word spread on the street that there were no more seats and that the discussion would be transmitted by radio. However, only those who had spoken out against bazudine could understand the words. Any attempt to cast doubt on their conclusions was interrupted by—how can I put it mildly—hardly respectful shouts."

What sort of attitude should one have toward Ekologiya after all that has been said? Perhaps declare the club dangerous and petition for its abolition? I asked V. Bezin, secretary of the CPSU gorkom, A. Reutov, deputy chairman of the Krasnoarmeysk rayispolkom, and many comrades in responsible positions. No one decided to respond categorically, no one denied the well-known benefits of the "informals" actions. Then what are these benefits, and can they justify these extremes?

I do not think that club members would begin to argue that bazudine is not the main issue for Volgograd (the fate of its production is now being decided). Rather, it was the straw that broke the camel's back of the peoples' patience. For there is simply nothing to breathe in our illustrious city, especially in its southern regions. Volgograd waits in fear of summer, when the temperature in an apartment may not even fall below 30 degrees even at night and where a window cannot be opened because of the far from fragrant smells. Sleep in a gas mask if you will! Here too the "informals" have focused attention on the fact that nature-preserving organizations—the air and water inspections, the sanitary and epidemiologic service, and others—are too liberal with enterprises and, step by step, retreat when confronted with arguments about "industrial necessity." The Party obkom office is sometimes asked why it fails to resort to decisive measures. They responded by closing a particularly "fragrant" synthetic fatty acids production facility at an oil refinery

and the entire MPS wood-preserving plant. And so? In a short time, more environmental protection work was done at these plants than in the previous 5 years!

But, understandably, you can't remake all Volgograd's industry at once. The people understand this and Ekologiya does, too.

"With the start-up of bazudine production, emissions at the 'Kaustik' Association will decrease," announced Yu. Besspalov, Minister of the Chemical Industry during a recent visit to Volgograd, "because we are commissioning it with a full set of cleaning facilities and, at the same time, eliminating the old complex."

Here was something for the audience to applaud. But where is the guarantee that Yuriy Andreyevich will stop the production of atmosphere-poisoning Trichlorfon tomorrow? Or that he will not postpone construction of 137 bazudine plant cleaning facility projects the day after tomorrow? There are no such guarantees.

And what about local agencies that are supposed to give priority to environmental protection measures? In VOLGOGRADSKAYA PRAVDA, V. Levkin, chairman of the Krasnoarmeysk rayispolkom, verbosely described how splendidly atmospheric air monitoring is organized—the hydrometeorological observatory with its round-the-clock stations, the regional sanitary-and-epidemiologic station that does weekly flame tests and takes samples at the public's request, and the mobile laboratory.... However, this lauded monitoring system cannot, for example, determine the precise cause of the unprecedented smog that fell on the city August 6 and 7.

At the latest session at the CPSU obkom office, which discussed the complicated situation at the Khimprom Production Association, obkom secretary V. Balandin reproached general director A. Kovalev because they reacted to the still-frequent "gassings" less sharply than did the association's rank-and-file personnel, the members of Ekologiya. The reproach was valid. If the attitude in Volgograd toward environmental protection issues has become stricter, it is due to the influence of Ekologiya.

So what then? Pointing a finger at trouble does little; one must straighten one's shoulders and put things in order. Whether or not Ekologiya is wanted, its current position of decisive confrontation, its mistrust of everything official, and its independence has produced little. It would be more beneficial if club members themselves would become activists in different inspection services monitoring the environment. It has been suggested that volunteer groups be established at each environmental protection site being built to monitor the quality and rate of work and to prevent deviations from design and planning documentation and ecological stations designed to help prevent accidents be established at existing plants. Volunteers have yet to be found. But I

am sure that they will be, provided municipal organizations and Ekologiya overcome their mutual alienation. You see, we breathe the same air, and it must be clean.

**Electro-Mass Transfer Near Ion-Exchange Membrane With Highly Charged Polyelectrolyte Ions Present**

18410007a Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10, No 3, May-Jun 88 (manuscript received 12 Jun 86) pp 195-199

[Article by Ye. N. Korzhov and V. M. Starov, Vornesh University; Moscow Food Industry Technology Institute]

[Abstract] A theoretical model is presented for the study of the specifics of electro-diffusion processes near ion-selective ionite membranes when the desalinated solution contains highly charged ions of a certain polyelectrolyte. It is shown that small quantities of polyelectrolyte solution lead to significant changes in the electro-mass transfer conditions in the vicinity of the membrane. The resistivity of the membrane system is reduced and the phenomenon of concentration polarization is qualitatively changed. Figures 4, references 12: 6 Russian, 6 Western.

UDC 541.183.12

**Bipolar Membrane Charge Selectivity Theory Considering Water Dissociation Product Transfer**

18410007b Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10, No 3, May-Jun 88 (manuscript received 9 Jan 87) pp 199-203

[Article by V. I. Kovalchuk and E. K. Zholkovskiy, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is made of the transfer of an electrolyte of complex ionic composition through a bipolar membrane consisting of a thick cation-exchange layer and a thin anion-exchange layer with constant fixed charge of each layer. The transfer of the dissociation products of water is also considered, since bipolar membranes can generate acids and bases. The presence of immiscible layers of liquid at the membrane surface is not considered. Since the current through the membrane is carried primarily by cations, concentration polarization can arise in layers near the surface as well as at the surface of the cationite membrane. However, this factor is not considered significant since the limiting current in a bipolar membrane is significantly less than the possible limiting current related to polarization of the diffusion layer. Figures 1, references 11: 9 Russian, 2 Western.

UDC 663.067:537.226

**Optimal Porosity of Model Dielectric Membrane**

18410007c Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 12 Apr 87) pp 203-205

[Article by A. E. Yaroshchuk and V. I. Dzyub, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] A simple membrane model permitting sequential analysis of the flow through the membrane and its selective properties is used to calculate the optimal value of membrane porosity at which both selectivity and productivity of the membrane are high. The model is that of an infinite system of alternating flat layers of solvent and dielectric matrix. Dielectric exclusion is taken as the mechanism of ion selectivity. It is suggested that porosity be increased by the formation of track channels by bombarding membranes with heavy ions in order to decrease the number of closed pores and increase the intensity of dielectric exclusion. Figures 2, references 5: 3 Russian, 2 Western.

UDC 541.183

**Analysis of Active Carbon Pore System Structure Using Aqueous Solution Absorption Data**

18410007d Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 21 Oct 86) pp 205-209

[Article by A. V. Mamchenko and T. I. Yakimova, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] An attempt is made to determine whether data on the adsorption of aqueous solutions by organic substances can be used to generate the required volume of information on the structure of active carbon pore systems, as can vapor absorption isotherms. Studies were performed on active carbon specimens differing significantly in structure and sorption characteristics, plus nonporous carbon black. The adsorption of organic substances with little solubility in water was measured, adsorption isotherms being determined by the ampule method. Significant differences in the statistical mean layer thickness of the different adsorbed solutions allows pore capacity parameters to be determined by the method. It is found that adsorption by a surface mechanism causes filling of some supermicropores for which the volumetric mechanism of vapor adsorption is characteristic. Consequently, when analyzing the influence of active carbon pore system structure on adsorption of solutions to determine an effective carbon adsorbent structure for water purification processes, preference

must be given to the structural sorption characteristics calculated from experiments in following adsorption of solutions. Figures 2, references 13: 12 Russian, 1 Western.

UDC 628.337:541.138

**Electrochemical Oxidation of Oxalates In Liquid Nuclear Power Plant Wastes**

18410007e Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 10 Apr 87) pp 221-224

[Article by E. P. Lapin, D. A. Musakin, S. A. Kishkin, M. S. Oleynik and D. B. Shuyskiy, All-Union Scientific and Production Institute of Complex Power Technology, Leningrad]

[Abstract] A study is made of electrochemical oxidation of oxalic acid and oxalates. Electrolysis of solutions was performed in a continuous 150 ml electrolyzer with three flat parallel electrodes, two cathodes and one anode, measuring 70x30 mm. Oxalic acid concentration was determined by a permanganate method, carbonates by  $\text{CaCO}_3$  precipitation. The laboratory studies showed that graphite, lead and titanium with manganese or ruthenium dioxide coatings are practically equally effective as anodes. Reducing the current reduced the consumption of power for oxidation of oxalic acid; increasing current increased the rate of oxalic acid decomposition, but also increased the voltage across the electrodes, increasing power consumption and temperature, possibly causing boiling. At 1 A/dm<sup>2</sup>, the power consumption was 20-60 kW hr/m<sup>3</sup> and the salt content of the waste was reduced by a factor of 1.5. Figures 3, references 4: Russian.

UDC 541.183.5+628.31

**Regeneration of Polysorb and Active Carbon Saturated With Bentazon**

18410007f Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 5 Jun 87) pp 224-226

[Article by Ye. S. Shlyuger, V. V. Podlesnyuk and T. M. Levchenko, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] Data are presented from studies on the absorption extraction of bentazon from wastewaters by the polymer sorbent polysorb 40/100 and type AG-3 active carbon, and various methods of regenerating these sorbents are compared. Bentazon-containing wastewaters are formed during washing of the finished product in plant protection agent manufacture. Bentazon (3-isopropylbenzo-2,1,3-thiadiazinone-4-dioxide 2,2) is a white insoluble crystalline substance with m.p. 137-139°C which represents an increasing problem for extraction from aqueous solutions. The possibility was

studied of regenerating polysorb with ethanol and chloroform. It was found that eluent regeneration of polymer sorbents saturated with bentazon was more effective than for active carbon. Polysorb is therefore recommended for extraction of bentazon from wastewater with subsequent regeneration with chloroform or ethanol. Figure 1, references 11: 9 Russian, 2 Western.

UDC 628.543.49.081.31

**Sorption Removal of Caprolactam From Polyamide Fiber Production Wastewaters**

18410007g Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 30 Mar 87) pp 226-228

[Article by I. S. Glushankova, A. D. Smirnov and I. D. Radziller, All-Union Scientific Research Institute of Water Supply, Sewerage, Water Engineering Structures and Engineering Hydrogeology, Moscow]

[Abstract] A study is made of the adsorption of caprolactam from aqueous solutions on various carbon sorbents in order to select an active carbon which is most effective for industrial use in purification of wastewaters. Adsorption of caprolactam on industrial active carbons and several experimental specimens differing significantly in pore structure was studied. Experimental studies were performed under static conditions on a narrow fraction of active carbon, particle diameters 0.2-0.315 mm, active carbon dose 0.5-10 g/l, caprolactam concentration 200-3000 mg/l, adsorption time 3 hours, which was found to be sufficient to achieve equilibrium. It was found that caprolactam is primarily absorbed in the micropores of active carbons, with a maximum degree of filling of the micropore volume not over one, depending on micropore size. Most effective are active carbons with slit-shaped micropore width 0.5-0.6 nm. Sorption is little dependent on process temperature. Figures 1, references 7: 6 Russian, 1 Western.

UDC 543.381+665.654.2

**Direct Full Hydrogenolysis—New Simple Method For Determining Total and Organic Carbon In Water and Aqueous Solutions**

18410007h Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 28 Jul 86) pp 234-238

[Article by B. V. Stolyarov and E. Ye. Galev, Leningrad University imeni A. A. Zhdanov]

[Abstract] A new method is suggested for determining total and organic carbon in water and aqueous solutions, based on direct, full hydrogenolysis of volatile and nonvolatile organic compounds of various classes and  $\text{CO}_2$  in an atmosphere of hydrogen on the surface of a nickel catalyst at 350-400°C. The method is distinguished by its simplicity, requiring only minimum modification of the standard gas chromatograph, and reliability, since hydrogenolysis is



performed under static conditions with dosage of a portion of the aqueous solution to be analyzed directly into a layer of nickel catalyst with subsequent transfer of water vapor and methane into a separating column with molecular sieve and then into an ionization-flame detector. The reproducibility and correctness of determining organic carbon in aqueous solutions were found to be quite good, achieving complete conversion of model compounds with molecular mass up to 300 to methane. The new simple method is suitable for determining total and organic carbon in various objects where the carbon content is at least 5 mg/l. Figures 2, references 16: 10 Russian, 6 Western.

**Sorption Concentration And Atomic-Absorption Determination of Heavy Elements In Natural Waters**

18410007i Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 18 Dec 86) pp 238-240

[Article by A. I. Samchuk, Yu. Ye. Kazakevich, N. N. Romanov, Ye. Ya. Danilova, T. A. Khabazova and K. V. Fedotov, Institute of Geochemistry and Mineral Physics, Ukrainian Academy of Sciences, Kiev; Leningrad Institute of Textile and Light Industry]

[Abstract] Data are presented from a study of the sorption concentration of Cu, Pb, Cd, Ni, Co and Zn on a fibrous chelate sorbent and their atomic-absorption determination in natural waters. A polyacrylonitrile fibrous chelate sorbent with thioamide groups was used. The heavy metals were determined by atomic absorption in flame and flameless versions on a dual-beam spectrophotometer. The results were used to develop a method for atomic-absorption determination of the metals in natural waters, and used for analysis of river and mine waters, complexes of the metals with natural acids being broken down by boiling water specimens following preliminary acidification with sulfuric acid and the addition of  $K_2S_2O_8$ . Evaporation of water specimens with the addition of  $HNO_3$  and  $HClO_4$  also causes breakdown of organic substances and converts all forms of metals to labile forms which are sorbed by the chelate sorbent. However, this method is less effective and takes more time. The limit of detection of the metals was: Cu 0.02, Pb 0.06, Cd 0.01, Ni 0.06, Co 0.06 and Zn 0.01  $\mu g/l$ . Figures 2, references 4: Russian.

UDC 543.257.2

**Extraction-Chromatographic Determination of Diethanolamine In Wastewaters**

18410007j Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 9 Mar 87) pp 243-245

[Article by L. V. Nevinnaya and Yu. A. Klyachko, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] Studies of the extraction-chromatographic determination of diethanolamine in wastewater were performed with diethanolamine in the class of alkanolamines, containing two free hydroxy groups and one

secondary amino group. A gas chromatograph with flame-ionization detector and U-shaped quartz glass column with inside diameter 3 mm, length 600 mm was used for chromatography of diethanolamine derivatives. The column was filled with siloxane 5 percent on chromotone, column temperature 170°C. The studies indicate that dimethylacetamide can be recommended for extraction-gas-chromatographic determination of diethanolamine in wastewater. The use of lower aliphatic alcohols, which also have good extracting capacity, is limited by the fact that they significantly increase the volume of the acylating mixture upon acylation. References 12: 8 Russian, 4 Western.

UDC 628.16

**Purification of Drinking Water With Clinoptilolite Filters**

18410007k Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 18 Dec 86) pp 255-259

[Article by V. A. Kravchenko, Yu. I. Tarasevich, G. G. Rudenko, S. G. Kozhushko, A. S. Korostyshevskiy and N. D. Kravchenko, Scientific Research and Design-Technological Institute of Mining; Institute of Colloid Chemistry and Water Chemistry imeni A.V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is made of the use of clinoptilolite (zeolite) filters (final stage), chlorinated or ozonated (first stage), as well as contact coagulation to intensify purification processes and provide guaranteed water quality, while decreasing costs and consumption of reagents. It was found that filtration rate is inversely proportional to decoloration of water on zeolite. Substances coloring water were more completely removed at 3-10 m/hr on zeolite than on expanded clay aggregate. As the filtration rate increased, the difference in filtrate quality decreased, and at over 12 m/hr the substances operated identically. With water color up to 30°, turbidity up to 2 g/m<sup>3</sup>, a simplified system can be used: Chlorination and zeolite filtration. Water with up to 50-60° color and turbidity up to 10-20 g/m<sup>3</sup> can be purified by chlorination and contact coagulation on zeolite filters, eliminating the use of settling structures during certain seasons. The layer of 1-3 mm zeolite must be at least 1.5 m thick, with filtration time at least 12 hours. Zeolite filtration plus ozonation is suitable with water color rating 40-50°, turbidity 3-5 g/m<sup>3</sup> or less. This achieves a significant improvement in quality characteristics without the use of settling. Figures 2, references 5: Russian.

UDC 66.013.8:628.5

**Use of  $SO_2$  to Purify Chromium-Containing Wastewaters**

18410007l Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 20 May 87) pp 262-264

[Article by N. T. Okopnaya, A. N. Maftulyak, V. A. Yurasova, O. V. Kovaleva and V. M. Ropot, Institute of Chemistry, Moldavian Academy of Sciences, Kishinev]

[Abstract] Studies are presented of the process of reducing Cr (VI) over a broad range of its concentrations in

solution using  $\text{SO}_2$  and the reducing agent in place of sodium sulfite or bisulfate. Laboratory experiments were performed with model solutions of potassium bichromate, plus a concentrated solution of Cr (VI), the filtrate obtained in removal of heavy-metal ions as hydroxides from spent galvanic shop passivation bath electrolyte. The Cr (VI) content in the filtrate was 14.7 g/l. The reduction reaction was performed in a reactor consisting of a glass pipe 700 mm in length and 40 mm in diameter, with gaseous  $\text{SO}_2$  bubbling through a porous glass filter into the upward moving flow of chromium-containing solution. The quantity of  $\text{SO}_2$  expended in reducing a unit mass of Cr (VI) depended on the concentration of chromium in the initial solution. At 0.2-10 g/l, the reaction is practically stoichiometric. At higher and lower concentrations,  $\text{SO}_2$  consumption increases. The use of  $\text{SO}_2$  as a reducing agent allows purification of chromium-containing waters over a broad interval of Cr (VI) concentrations, providing a continuous process and decreasing mineralization of the water purified, increasing the possibilities for its reuse. Figure 1, references 6: Russian.

#### Purification of Shale Processing Plant Wastewaters With Ozone

18410007m Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 10 No 3, May-Jun 88 (manuscript received 4 Jan 87) pp 264-266

[Article by G. I. Rogozhkin, All-Union Scientific Research Institute of Water Supply, Sewerage, Water Engineering Structures and Engineering Hydrogeology, Moscow]

[Abstract] A quantitative estimate is presented of the effectiveness of final purification of wastewaters from shale-processing plants by the use of ozone, which fully oxidizes phenol and resorcinol as well as benzpyrene. Ozone and chlorine were used to treat the filtrate of a mixture of industrial shale processing plant wastewaters and domestic wastewaters after biochemical purification in aeration tanks. Ozonation was performed in a semi-continuous mode in a gas-liquid mixture with a simple ceramic dispersing filter. The filtrate pH remained constant in an acid medium, increasing from 7.6-7.9 in a neutral medium due to desorption of carbon dioxide, gradually decreasing from 11.1-9 in an alkaline medium. The effectiveness of ozone purification depended on pH. In the acid medium, the chemical oxygen minimum very slowly decreased by 10-15 mg/l, of no practical significance. In a neutral medium, COM dropped by 50 and 70 mg/l with 40 and 60 mg/l ozone. In an alkaline medium, COM dropped by 40 and 75 mg/l with absorbed ozone doses of 75 and 100 mg/l. Preference can be given to a neutral medium, which achieves the same effectiveness with a lower dose of ozone and without the use of alkaline reagents. Water color and odor are improved by the process and phenols are removed. Ozonation is doubtless preferable to chlorination, achieving a great improvement in odor and taste, removing phenols and leaving no residual reagent. The dose of absorbed ozone

is 12 times less than that of chlorine, the need for dechlorination is eliminated and the salt content of the water is not increased. Figures 2, references 11: 10 Russian, 1 Western.

#### Electrochemical Decoloration of Wastewater Containing Organic Dyes

18410007n Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 10 No 3, May-Jun 88 (manuscript received 3 Apr 86; in final form 13 Oct 87) pp 266-269

[Article by S. V. Yakovlev, I. G. Krasnoborodko and Ye. S. Svetashova, Leningrad Institute of Construction Engineering]

[Abstract] A study is made of the nature of the products formed upon decoloration of wastewater in a nondiaphragm electrolyzer in order to confirm existing concepts of the essence of electrochemical destruction of organic dyes. Experiments were performed on model dye solutions containing 0.1-0.5 g/l dye with ruthenium oxide anode and steel cathode: Processing time 5-15 minutes, anode current density 150-200 a/m<sup>2</sup>, chlorine ion content 3 g/l. Dyes studied included congo red, acid blue and acid bright orange. It was found that process parameters providing decoloration of the wastewater resulted in 60-70 percent mineralization of the dyes with the formation of small quantities of aromatic compounds in both oxidized and reduced forms. The possibility was demonstrated in principle of further biochemical purification of production wastewaters following electrochemical decoloration. Figures 3, references 10: Russian.

#### Purification of Groundwater to Remove Hydrogen Sulfide and Fluorine

18410007o Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 10 No 3, May-Jun 88 (manuscript received 10 Mar 86; in final form 14 Jul 87) pp 269-271

[Article by A. I. Yershov, V. K. Syrbu, A. M. Romanov and R. V. Drondina, Institute of Applied Physics, Moldavian Academy of Sciences, Kishinev]

[Abstract] A study is presented of the stages of electroflotation removal of suspended  $\text{Al}(\text{OH})_3$ -AlF<sub>3</sub> and  $\text{Fe}_3\text{S}_{4-7}\cdot\text{Fe}_2\text{O}_3\cdot\text{H}_2\text{O}$  generated in electrocoagulation to remove fluorides and  $\text{H}_2\text{S}$  from water. The interval of water pH in which the  $\zeta$  potential of the suspended substances in the system  $\text{Al}(\text{OH})_3$ -AlF<sub>3</sub> has the minimum value was experimentally determined. It was shown that at pH 6.3-7.1, where the  $\zeta$  potential passes through the minimum of 1 mV, complex formation is maximal and this mode is optimal for the electroflotation process. Bubbling of air during chemical defluorination processes was found to reduce the consumption of aluminum to 6-10 g per g of extracted fluorine, increasing the degree of extraction of expended matter by 30 percent and achieving the maximum permissible  $\text{Al}^{3+}$  concentration at lower energy cost. The optimal

conditions for extraction of fluorine and hydrogen sulfide were found to be: Current density in flotation unit 0.5-1.2 A/dm<sup>2</sup>, L/g ratio 4.0 kg/kg, consumption of aluminum 6-10 kg/kg fluorine ion. Figures 5, references 5: Russian.

**Removal of Manganese, Phosphates and Fluorides From Water By Filtration Through Partially Roasted Dolomite**

18410007p Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 10 Dec 86) pp 275-276

[Article by G. K. Shablovskaya, O. Zhumanov, A. B. Zabarilo and I. T. Goronovskiy, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] One effective method of removing manganese compounds from water is filtration with various active filter charges. Manganese is removed from water as its hydroxides and oxides only at pH at least 9. The rate constant of manganese removal was calculated, assuming that the reaction is pseudomonomolecular. The data obtained are used to recommend a technology for manganese removal from river water on combined-action filters containing inert sand and a reactive charge of partially roasted dolomite, used to bond corrosive carbonic acid formed as the water is purified with coagulants. The filtration method suggested for removal of phosphates on granulated partially roasted dolomite is significantly simpler than methods recommended in the literature. Figures 3, references 4: Russian.

**Electrodialysis of Humic-Substance Solutions on Ultrafiltration Membranes**

18410007q Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 11 Feb 87) pp 277-278

[Article by V. D. Grebenyuk, N. P. Strizhak, G. V. Slavinskaya and Ye. A. Merkulova, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is presented of the process of electrodialysis of solutions containing organic substances using ultrafiltration and ion-exchange membranes. Studies were performed on humic and fulvic acids extracted from river water by concentration on a porous anionite. The data showed that ultrafiltration membranes occupy an intermediate position in terms of conductivity between cationite and anionite membranes. Electrodialysis was performed in six-chamber equipment, operating continuously for 48 hours in galvanostatic mode with current density 10 mA/cm<sup>2</sup>. The maximum brine concentration upon electrodialysis of 0.05 M solutions of Na<sub>2</sub>SO<sub>4</sub> was 30 g/l, almost seven times less than for electrodialysis of 0.01 M Na<sub>2</sub>SO<sub>4</sub> with the anionite and cationite membranes, indicating the possibility of using

ultrafiltration membranes for electrodialysis of humus-containing solutions when highly concentrated brines are not required. Figures 3, references 4: 3 Russian, 1 Western.

**Use of Phosphogypsum to Defluorinate Water**

18410007r Kiev *KHIMIYA I TEKHOLOGIYA VODY* in Russian Vol 10 No 3, May-Jun 88 (manuscript received 6 Apr 87) pp 280-282

[Article by V. E. Poladyan, L. M. Avlasovich, L. M. Burtchenko and A. M. Andrianov Institute of Physics and Chemistry imeni A. V. Bogatskiy, Ukrainian Academy of Sciences, Odessa]

[Abstract] It is suggested that calcium-containing phosphogypsum, the waste from production of mineral fertilizers, be used to intensify the traditional method of purification of industrial wastewaters by precipitation of F<sup>-</sup>. In order to select optimal conditions, the influence of pH, precipitant consumption and process kinetics on purification effectiveness was studied. Precipitation was found to occur at pH 1.5-2.5, the fraction of precipitated for fluorine increasing with increasing pH and reaching its maximum at pH 6-11. A three-times excess of phosphogypsum is sufficient to achieve residual fluoride content at the level of CaF<sub>2</sub> solubility; further increases in phosphogypsum yield no positive effect. Fifteen minutes of contact is sufficient to achieve stable degree of precipitation. The sediment formed has good sedimentation properties, achieving virtually complete settlement after 60 minutes standing time. Figures 3, references 5: Russian.

UDC 543.8 + 535.379

**Chemiluminescent Method for Determining Anionic Surfactants**

18410008c Ivanovo *IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHOLOGIYA* in Russian Vol 31 No 6, Jun 88 (manuscript received 27 Oct 87) pp 127-128

[Article by I. V. Pyatnitskiy, A. Yu. Nazarenko, and O. A. Zaporozhets, Kiev State University imeni T. G. Shevchenko]

[Abstract] Anionic surfactants are widely used as synthetic detergents and in dyeing fabrics in the textile industry, which makes it necessary to be able to determine these substances in various media such as natural waters and wastewaters. They are determined chiefly by extraction-photometric methods of analysis based on the formation of ionic associates of the dyestuff cation. Sensitivity is limited to 0.2 mg/L. In the present work it was found that anionic surfactants may be quantitatively extracted from chloroform with the leucygenine cation (10, 10 prime-dimethylbiacridylum dinitrate). This substance was found to be an effective chemiluminescent reagent capable of detection at very low concentrations



(10 to the minus 8 molar and less). It may be quantitatively extracted from chloroform with 0.1 molar KOH. The sensitivity limit is 4  $\mu\text{m/L}$ , and the entire analysis requires only 5 minutes. References: 7 (Russian).

UDC 546.799

**Separation of Transplutonium Elements in Process of Transport Through Liquid Membranes Containing Tri-N-Octylamine**

18410377a Leningrad RADIOKHIMIYA in Russian  
Vol 30 No 3, May-Jun 88 (manuscript received  
25 Jun 87) pp 362-365

[Article by A. P. Novikov, T. V. Bunina, and B. F. Myasoyedov]

[Abstract] A study of the extraction of transplutonium elements from solutions of different complex-forming substances by "water-in-oil"-type emulsions containing tri-n-octylamine used radiochemically pure isotopes  $^{241}\text{Am}$ ,  $^{243}\text{Cm}$ , and  $^{249}\text{Cf}$  with  $\gamma$ -spectrometric measurement of the relative isotope level in the phases. The emulsifier was span-80. The study confirmed the favorable prospects for use of emulsion membrane extraction for processing radioactive solutions. The method has some technical and economic advantages over traditional liquid extraction and is, in some cases, more effective and more selective. Figures 4; references 6: 5 Russian; 1 Western.

UDC 621.039.58

**Effect of Diffusion of Radionuclides on Selection of Conditions of Burial of Radioactive Wastes**

18410377b Leningrad RADIOKHIMIYA in Russian  
Vol 30 No 3, May-Jun 88 (manuscript received  
5 Mar 87) pp 380-385

[Article by M. A. Nikolskiy, A. L. Fedorov, T. N. Fedotova, V. T. Sorokin, A. Ye. Kozlov, T. V. Mikhaylova, and V. Ye. Tkalov]

[Abstract] A mathematical model that can be used to assess the reliability of multibarrier protection used for the underground burial or surface storage of radioactive wastes was described and discussed. Problems entailed in selecting reliable storage or burial systems were discussed. It was found that the radiation hazard on the container surface may be quite complicated, even barring any accidents, because of the diffusion transport of radionuclides in the container material. Because of this it is necessary to make an allowance for the effect of diffusion when selecting materials and developing designs for units for the burial or storage of radioactive wastes. Figures 3; references 4: 3 Russian; 1 Western.

UDC 613.169.16:631.811:546.02+613.84.4:631.811.2

**Passage of Uranium, Thorium, and Radium Isotopes From Soils and Fertilizers Into Plants**

18410377c Leningrad RADIOKHIMIYA in Russian  
Vol 30 No 3, May-Jun 88 (manuscript received  
5 Mar 87) pp 385-391

[Article by L. V. Shishkunova, S. M. Grashchenko, and V. N. Strukov]

[Abstract] Field and vegetation experiments were conducted to assess the amount of entry of uranium, thorium, and radium isotopes from the soil into farm plants and to compare the availability of radionuclides to plants from the soil and from fertilizers. Entry of heavy natural radionuclides into the plants was measured by the build-up factor, which is defined as the ratio of specific activity of the radionuclide in ash or dry substance of the plant to its specific activity in dry soil. The field experiment involved barley grown on sod-podzolic loamy and peaty soils with the use of commercial ammophos. The vegetation experiment involved growing plants on these same soils and using model ammophos having high specific heavy natural radionuclide activity. In accordance with the build-up factor by individual plant, the elements were arranged in the series Ra [is greater than] U [is greater than] Th for sod-podzolic soils and Ra [is greater than] U-Th for peaty soil. Application of ammophos to the soils in a 400 kg/hectare dose and a 4-fold to 10-fold increase of the dose did not affect the entry of U and Th isotopes into plants. A noticeable increase in specific activity of Th isotopes occurred after the addition of ammophos to sod-podzolic loam. The nonuniform behavior of the radionuclides after phosphoric fertilizer was applied to the soils was attributed to the different form of their existence in the soil and to the effect of the fertilizers on the equilibrium of the firmly fixed radionuclides and those assimilable by the soil. Availability of Th to the plants from ammophos was 100 times less than that from the soil. References 12: 10 Russian; 2 Western.

UDC 502.55(204):621.039.7

**Study of Radioactive Contamination of Baltic Sea Waters in 1986**

18410377d Leningrad RADIOKHIMIYA in Russian  
Vol 30, No 3, May-Jun 88 (manuscript received  
2 Nov 87) pp 395-401

[Article by L. N. Lazarev, Yu. V. Kuznetsov, L. I. Gedeonov, V. M. Gavrilov, Z. G. Gritchenko, L. M. Ivanova, T. Ye. Orlova, and N. A. Tishkova]

[Abstract] This study showed the nonuniformity of the contamination of the waters because of different densities of atmospheric radioactive fallout. The increase in the cesium-137 level in the Bay of Finland was 100 times greater than the level measured in 1983-85, but it

remained 500 times lower than the concentration permitted in drinking water in the USSR. The cesium-137 level in river waters was more than 1,000 times below the permissible level. A comparison of the cesium-137 level in the Baltic Sea in 1986 and preceeding years was presented and discussed. River waters may be diluting the cesium isotopes' level in the Baltic sea. Water from the Northern Sea will continue to increase the cesium-137 level in the Baltic Sea since the cesium level in the Northern Sea is higher than that in the Baltic Sea because of emissions from nuclear power plants in Western Europe. Preliminary results of a determination of plutonium-239 and plutonium-240 levels in the Baltic Sea were presented. Figures 4; references 12: 2 Russian; 10 Western.

UDC 662.74:621.928.9

**Two-stage Coking Dust Suppression System**

18410349b Moscow KOKS I KHIMIYA in Russian  
No 6, Jun 88 pp 52-53

[Article by V. T. Stefanenko, candidate of technical sciences, T. I. Voronkova, A. I. Komolikhov, Eastern Coal Chemistry Scientific Research Institute, A. V. Farafontov, A. L. Shteyn, candidate of technical sciences, and I. S. Khlevnoy, Kemerovo Coking By-product Plant]

[Abstract] An improved dust-catching system, which has been used at the Kemerovo Coking By-product plant since 1986, has improved work conditions, reduced

harmful emissions into the atmosphere, reduced water consumption, reduced the use of sludge, and produced dry coke dust in commercial form. The savings from the reduction of coke dust emission into the atmosphere amount to nearly 2 million rubles annually. The system's reliability and efficiency of the system recommend it for wide-scale industrial use. Figure 1.

**Removing Cyanides in Form of Prussian Blue From Wastewaters**

18410349c Moscow KOKS I KHIMIYA in Russian  
No 6, Jun 88 pp 53-55

[Article by N. V. Sokratova, candidate of technical sciences, N. O. Lebedeva, doctor of technical sciences, V. N. Brinza, MISiS, and V. N. Druzhinin, NLMK]

[Abstract] A study of model solutions of potassium cyanide and wastewaters from nitrogen fertilizer production containing  $CN^-$ ,  $NH_4^+$  and  $SCN^-$  at pH 9.5-10.5 showed that the use of ozone as an oxidizing agent during processing of cyan-containing sewage greatly extends the possibilities of using this oxidizing agent. Realization of these possibilities in industry will help to create a new waste-free technology. Figures 2; references 5 (Russian).

UDC 620.193.54:668.2

**High Temperature Oxidation of Metallic Technetium**

18410078a Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian  
Vol 33 No 10, Oct 88 (manuscript received 7 Mar 87)  
pp 2449-2452

[Article by V. I. Spitsyn (deceased), K. G. Bukov, A. M. Yemelyanenko, L. N. Fedotov and T. K. Titova, Institute of Physical Chemistry, USSR Academy of Sciences]

[Abstract] Oxidation kinetics of metallic technetium was studied in air atmosphere at 100-500 degrees C in order to determine the relationship of this process to rate constants and to temperature. It was shown that, up to 300 degrees C, no changes occurred in the sample. In the temperature range 325-525 degrees C, the oxidation process could be described by a linear function  $g = -Kt$  where  $g$  = weight gain of the sample,  $K$  = oxidation rate constant and  $t$  = time. The sample actually loses weight during the oxidation because of the formation of volatile  $Tc_2O_7$  oxide. The activation energy of this process was calculated to be 90 kJ/mole. Figures 2; references: 4 (Russian).

UDC 54.057:546.284

**Synthesis of Silicon Dioxide from Tetrachlorosilane and Nitrogen and Sulfur Dioxides**

18410078b Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian  
Vol 33 No 10, Oct 88 (manuscript received 17 Dec 87)  
pp 2457-2461

[Article by V. D. Butskiy, L. N. Zorya, V. B. Lazarev, V. A. Onayko, G. P. Panasyuk and L. G. Podzolko, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, USSR Academy of Sciences]

[Abstract] Possibility of synthesizing hydroxyl-free silicon dioxide from  $SiCl_4$  and  $SO_2$  or  $NO_2$  was studied. In preliminary work, optimal conditions and possible formation routes of the impurities were investigated at normal pressure in the systems  $SiCl_4 + n_0SO_2$ ;  $SiCl_4 + n_0NO_2$ ; and  $SiCl_4 + n_0NO_2 + n_0SiO_2$  where  $n_0$  varied from 0.5 to 4 and the temperature ranged from 300 to 900 K. Reactions of  $SiCl_4$  with  $NO_2$  or  $SO_2$  alone did not yield the desired product. However, the last reaction in which both oxides were used, produced hydroxyl-free silicon dioxide albeit contaminated with large quantity of other by-products. Addition of trichlorosilane to the above system yielded proton containing silica gels. Figures 4; references 19: 12 Russian (5 by Western authors), 7 Western.

UDC 541.49:546.4/7:547.496.3

**Acetylcarbamide Structure and Its Coordination Method in Metal Complexes**

18410078c Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian  
Vol 33 No 10, Oct 88 (manuscript received 7 Dec 87)  
pp 2480-2486

[Article by Yu. Ya. Kharitonov, T. N. Gushchina, S. L. Kuznetsov and S. A. Slivko, Moscow Chemical Engineering Institute imeni D. I. Mendeleyev, Ist Moscow Medical Institute imeni I. M. Sechenov, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, USSR Academy of Sciences]

[Abstract] Acetylcarbamide ( $CH_3CONHCONH_2$ ) forms complexes with a number of metal salts but the structure of such compounds have not been clearly identified as yet. Approximation quantum chemical optimization of the geometrical parameters of acetylcarbamide was performed, providing calculations of its electronic structure (bond lengths, bond angles, effective atomic charges, heat of formation, ionization potential and dipole moments). It was concluded that the most probable conformation of the molecule required that both oxygen atoms be in trans position to the NH bond. Also with respect to each other, the oxygen groups are trans-located so that they cannot close metal chelate rings during the formation of complexes. Therefore, to form such complexes, the molecule must "unfold." Then, it can coordinate through the amide oxygen atom monodentantly or by a bridge type bond utilizing both oxygen atoms. Other physical properties of acetylcarbamide were reported: analysis of its normal vibrations and those of its deuteroderivatives, field strength and the distribution of the potential energy by vibration coordinates. Figures 3; references 12: 3 Russian, 9 Western.

UDC 543.226.546.185

**Reaction of Copper Sulfate with Ammonium Dihydrophosphate with Heating**

18410078d Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian  
Vol 33 No 10, Oct 88 (manuscript received 13 Mar 87)  
pp 2487-2490

[Article by I. A. Borukhov, B. M. Beglov, S. Zarinov and V. K. Khakimova, Institute of Chemistry, UzSSR Academy of Sciences, Tashkent]

[Abstract] Mechanical grinding of equimolar quantities of  $CuSO_4 \cdot 5H_2O + NH_4H_2PO_4$  yielded ammonium hydrosulfide and copper hydrophosphate; in case of stoichiometric rates, the products were ammonium sulfate, copper hydrophosphate and free phosphoric acid. Thermal conversions of these mechanical mixtures are quite complex, involving dehydration, condensation processes, formation of new compounds and their breakdown. It was shown that, depending on the ratio of



CuO/P<sub>2</sub>O<sub>5</sub>, the composition of intermediate and final products could vary. The final product is copper pyrophosphate in case of equimolar quantities of the starting reagents, and copper tetrametaphosphate when stoichiometric ratios were used. Figures 4; references: 6 (Russian).

UDC 546.185

**Potassium-Strontium and Ammonium-Strontium  
Triphosphates**

18410078e Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian  
Vol 33 No 10, Oct 88 (manuscript received 14 May 87)  
pp 2491-2494

[Article by O. P. Olshevskaya and Ye. A. Prodan, Institute of General and Inorganic Chemistry, BSSR Academy of Sciences]

[Abstract] The goal of this work was to investigate the reaction of potassium and ammonium triphosphates with strontium nitrate in aqueous solutions, to determine the composition of insoluble products and to establish optimal synthesis conditions for new salts free of the anionic degradation products. The starting solutions of the above components (at concentrations of 0.05; 0.1; 0.5; 0.7 and 1.0 mole-percent) were combined with different ratios of isomolar series from Sr<sup>2+</sup>:P<sub>3</sub>O<sub>10</sub><sup>5-</sup> = 0.1 to 1.0. These mixtures were kept at 20 degrees C for 4 days. The precipitates were filtered, washed with water, dried and analyzed. Optimal conditions for the synthesis of crystalline K<sub>2</sub>Sr<sub>2</sub>P<sub>3</sub>O<sub>10</sub>·7H<sub>2</sub>O, NH<sub>4</sub>Sr<sub>2</sub>P<sub>3</sub>O<sub>10</sub>·5H<sub>2</sub>O and an amorphous salt Sr<sub>3</sub>(P<sub>3</sub>O<sub>10</sub>)<sub>2</sub>·xH<sub>2</sub>O were determined. The products were free of impurities. Figures 2; references 4 (Russian).

UDC 548.736

**Synthesis and Structure of Double Polyphosphate  
NaEr(PO<sub>3</sub>)<sub>4</sub>**

18410078f Moscow ZHURNAL NEORGANICHESKOY  
KHIMII in Russian Vol 33 No 10, Oct 88 (manuscript  
received 21 Jul 87) pp 2503-2505

[Article by S. I. Maksimova, V. A. Masloboev, K. K. Palkin, A. A. Sazhenkov and N. T. Chibiskova, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov USSR Academy of Sciences]

[Abstract] In continuation of earlier studies of M'Ln(PO<sub>3</sub>)<sub>4</sub> compounds, synthesis and structure of NaEr(PO<sub>3</sub>)<sub>4</sub> were reported. A mixture Na<sub>2</sub>CO<sub>3</sub>, Er<sub>2</sub>O<sub>3</sub> and 86.5 percent orthophosphoric acid was kept for 24 hrs at 220 degrees C, followed by 7 days at 350-500 degrees C to complete the crystallization process. NaEr(PO<sub>3</sub>)<sub>4</sub> crystallized in monoclinic syngony with elemental cell parameters a = 7.155 (15); b = 12.987 (7); c = 9.662 (32) β = 89.32(2)°; z = 4; V = 897.7 Å<sup>3</sup>; d<sub>x</sub> = 3.74 g/cm<sup>3</sup>. Structure refinement was performed by the

method of least squares with consideration of the anisotropy of atomic heat vibrations. The unreliability factor was R<sub>int</sub> = 0.035. Fine structural changes appear when the dimensions of Ln<sup>3+</sup> cations are decreased from Nd to Er. Figure 1; references 2: 1 Russian, 1 Western.

UDC 546.185.46'712

**Synthesis and Properties of  
Magnesium-Manganese Double Hydrophosphates**

18410078g Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian  
Vol 30 No 10, Oct 88 (manuscript received 12 Oct 87)  
pp 2506-2510

[Article by N. M. Antraptseva and N. V. Zinovkina, Ukrainian Agricultural Academy]

[Abstract] Double magnesium-manganese hydrophosphates were synthesized by coprecipitation of Mg<sup>2+</sup> and Mn<sup>2+</sup> ions with the hydrophosphate ion (reaction of Mg and Mn hydroxycarbonates with a 55 percent monophosphoric acid) at pH 2.8, the temperature of 45 degrees, varying Mg and Mn content from 0 to 100 mole-percent. These products represent a continuous series of solid solutions. The hydrophosphates obtained crystallized in orthorhombic syngony and structurally resembled individual MgHPO<sub>4</sub>·3 H<sub>2</sub>O and MnHPO<sub>4</sub>·3 H<sub>2</sub>O. The volumes of the elemental cells, their densities and indices of refraction of polycrystalline Mg<sub>1-x</sub>Mn<sub>x</sub>HPO<sub>4</sub>·3 H<sub>2</sub>O (0 ≤ x ≤ 100) are directly related to their composition. This indicates high degree of homogeneity of the solid solution throughout the entire range of these compositions. Figures 3; references 9: 5 Russian, 4 Western.

UDC 546.655.3

**Synthesis of Cerium Polyphosphate, Its  
Characteristics and Systematization of Phosphates**

18410078h Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian  
Vol 30 No 10, Oct 88 (manuscript received 29 Aug 85)  
pp 2511-2514

[Article by G. A. Bukhalova, I. V. Mardirosova and M. M. Ali]

[Abstract] A solid state synthesis of cerium metaphosphate is described. The starting salts cerium nitrate, carbonate or acetate and NH<sub>4</sub>H<sub>2</sub>O<sub>4</sub> taken in stoichiometric quantities were finely ground and heated slowly in a platinum vessel to 100-300 degrees C with constant stirring the temperature increased slowly to 750 degrees C as the reaction progressed to completion and the mixture was kept at this temperature for 2 hrs; then it was slowly cooled to room temperature. Physical and chemical properties of Ce(PO<sub>3</sub>)<sub>3</sub> were determined along with the chain structure of its anion. Cerium phosphate was compared with phosphates of other metals and a graph was constructed on the basis of their ionic radii

and the covalence of their M-O bonds. From this graph it was shown that  $\text{Ce}(\text{PO}_3)_3$  is a polyphosphate. Figures 4; references 18: 10 Russian, 3 Western.

UDC 546.718:7654

**Synthesis and Properties of  $\text{La}_2[\text{Tc}(\text{OH})\text{Cl}_3]_3$**   
18410078i Moscow ZHURNAL NEORGANICHESKOY  
KHIMII in Russian Vol 30 No 10, Oct 88 (manuscript  
received 4 Feb 87) pp 2536-2540

[Article by L. L. Zaytseva, A. A. Kruglov, A. V. Romanov, V. Ye. Samsonov and E. G. Teterin]

[Abstract]  $\text{La}_2[\text{Tc}(\text{OH})\text{Cl}_3]_3$  was synthesized by the published method used for production of other double-charged cationic hexahalotechnetates; the product was shown to be lanthanum monohydroxypentachlorotechnetate crystallizing from water, insoluble in  $\text{CCl}_4$  and benzene. The product was analyzed by roentgenographic, thermal, chemical, IR, PMR, and EPR analytical methods. Its structure resembled that of zinc monohydroxypentachlorotechnetate and hexahalotechnetates of double-charged cations. Stability limits of  $\text{La}_2[\text{Tc}(\text{OH})\text{Cl}_3]_3$  and parameters of rhombic volume-centric lattice were determined:  $a = 10.11 \pm 0.02$ ;  $b = 7.08 \pm 0.02$ ;  $c = 7.09 \pm 0.02$ . Figures 4; references 14: 12 Russian (3 by Western authors), 2 Western.

UDC 546.273-325:542.61

**Extraction of Boric Acid from Calcium Chloride Solutions with 2-Ethylhexanol Containing an Inert Solvent**

18410078j Moscow ZHURNAL NEORGANICHESKOY  
KHIMII in Russian Vol 30 No 10, Oct 88 (manuscript  
received 7 Dec 87) pp 2612-2616

[Article by G. N. Tarasova, Ye. Ye. Vinogradov and I. N. Lepeshkov, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, USSR Academy of Sciences]

[Abstract] Possibility of extracting boric acid with organic solvents from aqueous solutions containing calcium chloride was investigated. Specifically, the effect of an inert solvent on extraction of boric acid with 2-ethylhexanol was studied. It was shown that the distribution coefficient  $D_{\text{B}_2\text{O}_3}$  is a function of the amount of inert diluent added and of the concentration of  $\text{CaCl}_2$ , but does not depend on the content of boric acid. Addition of kerosene to 2-ethylhexanol lowered the extraction of boron but the distribution coefficients were adequate for industrial purposes; coextraction of  $\text{CaCl}_2$  into the organic phase was lowered as well. The use of inert diluent lessened the need for an expensive reagent. Figures 3; references: 9 (Russian; 3 by Western authors).

UDC 541.5:546.821:537.531.8

**X-Ray Spectra and Electronic Structure of  $\text{La}_{1-x}\text{Sr}_x\text{CuO}_4$ ,  $\text{Y}_{1-x}\text{Ba}_x\text{CuO}_4$ , and  $\text{YBa}_2\text{Cu}_3\text{O}_7$**   
18410339a Moscow DOKLADY AKADEMII NAUK  
SSSR in Russian Vol 300 No 1, May 88 (manuscript  
received 21 Sep 87) pp 119-122

[Article by V. V. Nemoshkalenko, academician, UkSSR Academy of Sciences, V. N. Uranov, A. A. Yereshchenko, L. V. Guseva, and E. M. Rudenko, Institute of Physics of Metals, UkSSR Academy of Sciences, Kiev]

[Abstract] The discovery of high-temperature superconductors consisting of La-Sr-Cu-O- and Y-Ba-Cu-O-containing ceramics stimulated X-ray, photoelectric, and computational studies of the bond energy of core and valence electrons and the structure of energetic zones. It has also stimulated evaluation of copper ion charge and Fermi level electron density in these materials. This article reports a study of the electronic structures of  $\text{La}_{1-x}\text{Sr}_x\text{CuO}_4$ ,  $\text{Y}_{1-x}\text{Ba}_x\text{CuO}_4$ , and  $\text{YBa}_2\text{Cu}_3\text{O}_7$ . The x-ray equipment used reflects predominantly d, f, p, and core 3s electrons of copper, lanthanum, oxygen, and copper respectively. Lanthanum and barium spectra reflecting their 5p states were obtained under fluorescent excitation. All samples were cooled with flowing water to a surface temperature not greater than 40°C. Results obtained on  $\text{La}_{1-x}\text{Sr}_x\text{CuO}_4$  confirm that the prefermian region is formed primarily by d and p valence state atoms and oxygen. Oxygen p electrons are in nonequivalent positions in the crystal lattice. The lanthanum 5p shell electrons participate in chemical bonding. Electron density is transferred from lanthanum and copper to oxygen. Copper bond energies indicate that  $\text{La}_{1-x}\text{Sr}_x\text{CuO}_4$  is more ionically charged than is  $\text{YBa}_2\text{Cu}_3\text{O}_7$ . Copper's d electron charge of  $\text{YBa}_2\text{Cu}_3\text{O}_7$  is greater than that of  $\text{Y}_{1-x}\text{Ba}_x\text{CuO}_4$ . The  $\text{OK}_\alpha$  spectra of  $\text{Y}_{1-x}\text{Ba}_x\text{CuO}_4$  are practically independent of sample phase composition and similar to those of  $\text{BaTiO}_3$ . Nonequivalent positions for oxygen in the crystal lattice were noted. Figures 4; references 14: 5 Russian, 9 Western.

UDC 666.31.7

**Mechanochemical Ceramic Technology**

18410339b Moscow DOKLADY AKADEMII NAUK  
SSSR in Russian Vol 300 No 1, May 88 (manuscript  
received 2 Sep 87) pp 162-165

[Article by V. V. Zyryanov, V. F. Sysoyev, and V. V. Boldyrev, corresponding member, USSR Academy of Sciences, Institute of Solid Substance Chemistry and Mineral Ore Processing, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] A study examined the caking of titanium and barium so as to demonstrate the use of mechanochemical methods of increasing their charge dispersion and improve their granulometric composition and mixing. A

linear relationship between ceramic porosity and mean particle diameter was found for powders having homogeneous density and granularity that were obtained by wet grinding in a ball mill and/or separated according to particle size with a classifier. Powders obtained by dry grinding in a planetary-centrifuge mill agglomerated with a large variability in density, and the resulting porosities differed from the results predicted from particle size. In bimodal ceramics formed from coarse monofractions, the linear relationship between porosity and particle density did not pass through zero, which

indicated that the components retain their individuality. When plotted as a function of bimodal ceramic composition, the density and tangent of dielectric loss behaved similarly, but dielectric permeability was unexpectedly strongly dependent on composition. This is due to local zone formation. The results indicate that mechanochemical technology can sharply intensify agglomeration, which permits greater control of ceramic structure and properties, and can produce ceramics with greater activity for further agglomeration operations. Figures 4; references 5: 4 Russian, 1 Western.



UDC 547.341

**Synthesis, Structure, Reactivity and Properties of 1,2-Alkadienephosphonous Acids and Their Derivatives**

18410365a Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 23 Jan 87) pp 1193-1205

[Article by V. V. Belakhov, V. I. Yudelevich, B. I. Ionin, Ye. V. Komarov, and A. A. Petrov, Leningrad Technological Institute imeni Lensovet]

[Abstract] This article summarizes the results of study of the interaction of acetylene alcohols of different structure with hypophosphorous acid and a study of the structure and chemical conversions of components obtained. The possible practical applications of the components obtained were assessed as well. The study revealed hydrophosphoryl acetylene-allene regrouping that produced 1,2-alkadienephosphonous acids belonging to a new class of unsaturated hydrophosphoryl compounds. The article described reactions of 1,2-alkadienephosphonous acids with carbonyl compounds and azomethins, reactions of their oxidation, hydrochlorination, and hydrogenation. These reactions led to the synthesis of different derivatives belonging to other classes of organic phosphorous compounds including phosphonates, phosphinates, and 1,2-oxaphospholenes. The structure of the 1,2-alkadienephosphonous acids and their derivatives was proved by the use of nuclear magnetic resonance, electron paramagnetic resonance, infrared spectroscopy, and ultraviolet spectroscopy. A study of possible practical uses of 1,2-alkadienephosphonous acids and their derivatives was described. References 100: 79 Russian; 21 Western.

UDC 547.481:546.183

**Interaction of Mucochloric Acid With Trimethylphosphite**

18410365b Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 5 Nov 86) pp 1213-1215

[Article by B. A. Abruzov, N. A. Polezhayeva, and Ye. V. Yelshina, Scientific Research Chemical Institute imeni A. M. Buterov, Kazan State University imeni V.I. Ulyanov-Lenin]

[Abstract] A study of the interaction of mucochloric acid with trimethylphosphite showed that mucochloric acid interacts with trimethylphosphite in both acyclic and cyclic forms with formation of methyl(2-dimethoxyphosphoryl-3-chloro-4-oxo)-2-butenate and dimethyl(3,4-dichloro-2(5H)-(furanone-5-yl)phosphate. Dimethyl(3,4-dichloro-2(5H)furanone-5-yl)-phosphonate was produced by interaction of methyl(2,3-dichloro-4-oxo)-2-butenate with dimethylphosphorous acid. References 15: 10 Russian; 5 Western.

UDC 47.56+535.34+542.91

**Chlorotropic Tautomerism in Amidinetetrachlorophosphorates. Stereochemistry of Tautomers and Mechanism of Their Transmutation**

18410365c Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 31 Oct 86) pp 1216-1223

[Article by V. I. Kalchenko, V. V. Negrebetskiy, R. B. Rudy, and L. N. Markovskiy, Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev, All-Union Scientific Research Institute of Chemical Agents for Plant Protection, Moscow]

[Abstract] The method of dynamic nuclear magnetic resonance of  $^1\text{H}$ ,  $^{13}\text{C}$ , and  $^{31}\text{P}$  was used to study the mechanism of chlorotropic transitions, and the structure of hexacoordinated and pentacoordinated tautomers was examined. The objects of study were  $\text{N}^1$ -methyl- $\text{N}^2$ -alkyltrihalogenacetamidinetetrachlorophosphorates in tautomeric equilibrium with 2,2,2,4-tetrachloro-4-trihalogenmethyl-1,3-diaza-2-phosphatidines.  $\text{N,N}$ -dialkyltrihalogenacetamidinetetrachlorophosphorates were in tautomeric equilibrium with 2,2,2,4-tetrachloro-1,3-diaza-2-phosphatidines because of rapid reversible intramolecular migrations of the chlorine atom in the C-N-P triad. The effect of temperature, polarity of the solvent, and electron and steric parameters of substituents in the carbon and nitrogen atoms of the four-member cycle in the position of tautomeric equilibrium was discussed. Formation of a contact ion pair in the transition state indicated higher negative values for the activation entropy of chlorotropic tautomerism. Rotation of the isopropyl group around the C-N bond appeared in the  $\text{N}^1$ -methyl- $\text{N}^2$ -isopropylamidinetetrachlorophosphorates. Figure 1; references 10: 4 Russian; 6 Western.

UDC 547.341

**Homolytic Interaction of Phosphorus Trihalogenides With Enin Hydrocarbons**

18410365d Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 11 Dec 86) pp 1224-1235

[Article by Yu. I. Shvedova, S. A. Shilov, M. V. Sendyurev, A. V. Dogadina, B. I. Ionin, and A. A. Petrov, Leningrad Technological Institute imeni Lensovet]

[Abstract] A comparative study of oxidative chlorophosphorylation and photoinitiated bromophosphination of conjugating and nonconjugating enin hydrocarbons showed that oxidative chlorophosphorylation and ultraviolet-induced bromophosphination of 1,3-alkadienes caused the halogen to combine with the phosphorus-containing group by a triple bond with subsequent formation of 1-chloro-1,3-alkadiene-2-phosphonates and 1-bromo-1,3-alkadiene-2-dibromophosphines, respectively. The direction of the combining was coordinated

with the polar effects of the reagents. Oxidative chlorophosphorylation of nonconjugating enin (1-pentene-2-ine) formed products of combination by both double and triple bonds in a 3:1 ratio, respectively, which agrees with general ideas concerning the higher activity of a double bond than of a triple bond in radical reactions. Photoinitiated bromophosphination of 1-pentene-4-ine proceeded exclusively by a triple bond, which may explain the reversibility of the process of combining bromine and the phosphorus-containing fragment by a double bond during photoreaction. Figures 2; references 17: 14 Russian; 3 Western.

UDC 547.341

**Interaction of Propadienephosphonous Acid With Azomethines**

18410365e Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 17 Mar 87) pp 1235-1240

[Article by V. V. Belakhov, V. I. Yudelevich, B. I. Ionin, and M. A. Shneyder, Leningrad Technological Institute imeni Lensovet]

[Abstract] A study of the interaction of propadienephosphonous acid with different aromatic azomethines or their components showed that their reactions result in the formation of apposite (1-arylaminoalkyl)propadienephosphinic acids. These acids have low antiviral activity. Figure 1; references 20: 16 Russian; 4 Western.

UDC 547.341

**Reactions of Unsaturated Compounds. 131. Reaction of Enallene Phosphonates and  $\alpha$ ,  $\beta$ -Unsaturated Phosphorylketones With Chromylchloride**

18410365f Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 19 Mar 86) pp 1240-1247

[Article by Yu. M. Dangyan, M. R. Tirakyan, G. A. Panosyan, V. I. Denisenko, and Sh. O. Badanyan, Institute of Organic Chemistry, ArmSSR Academy of Sciences, Yerevan]

[Abstract] Study of reactions of vinylallene, isopropenylallene, and  $\alpha$ - and  $\beta$ -unsaturated phosphorylketones with chromylchloride showed that they produce phosphoryl-containing cycles: cyclopentenones, furans, furyl alcohols and furanones from vinylallene phosphonates, furanones from isopropenylallene phosphonates, and furans from  $\alpha$ - and  $\beta$ -unsaturated phosphorylketones. C-C splitting preceded the formation of furanones from enallene phosphonates. The presence of a methyl group in the  $\alpha$ -carbon atom of the vinyl group promoted the latter. References 16: 5 Russian; 11 Western.

UDC 547.241+547.24

**Reaction of Triarylamidophosphazobenzenes With Carboxylic Acids**

18410365g Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 18 Feb 87) pp 1258-1261

[Article by E. K. Rutkovskiy, V. G. Kostina, and N. G. Feshchenko, Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] A study of the reaction of triarylamidophosphazobenzene compounds with carboxylic acids proceeding with the formation of tetra-(arylamido)phosphonium carboxylates showed that triarylamidophosphazobenzenes interact readily with carboxylic acids with the formation of salts of phosphazene compounds. Stability of the tetra(arylamido)phosphonium carboxylates increased with an increase in nucleophilicity of the carboxylic acid anion and in basicity of the basic properties of the starting phosphazene compounds. References 6: 2 Russian; 4 Western.

UDC 547.241

**Intramolecular Interactions in Para-phosphorosubstituted Dimethylanilines**

18410365h Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 23 Jan 87) pp 1261-1269

[Article by G. V. Ratovskiy, L. M. Sergiyenko, S. L. Belaya, and A. A. Tolmachev, Irkutsk State University imeni A. A. Zhdanov, Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] A study of phosphorosubstituted dimethylanilines ( $n\text{-Me}_2\text{NC}_6\text{H}_4\text{Z}$  [ $\text{Z}=\text{PX}_2, \text{P(Y)X}_2; \text{X}=\text{Alk, OAlk, NAlk}_2, \text{Cl}; \text{Y}=\text{O, S}$ ]) involved detailed analysis of the infrared and ultraviolet spectra of the compounds. This analysis showed that the  $\pi$ -acceptor effect of  $\text{PX}_2$  and  $\text{P(Y)X}_2$  ( $\text{Y}=\text{O, S}$ ) is determined essentially by the nature of ligand X and increases in the sequence Et [is less than or equal to]  $\text{NMe}_2$  [is less than]  $\text{OEt}$  [is much less than]  $\text{Cl}$ . The  $\pi$ -acceptor effect of the phosphoryl groupings  $\text{P(O)X}_2$  was weakened due to competitive interaction of the unshared pairs of oxygen ( $\text{Y}=\text{O}$ ) with vacant orbitals of fragment  $\text{PX}_2$ . The competition was most evident when the chlorine ( $\text{X}=\text{Cl}$ ) is in an excited state. Such interaction with participation of unshared pairs of sulfur ( $\text{Y}=\text{S}$ ) was much weaker. The effect of the phosphoric substituents studied was attributed to a complex mechanism  $d, \pi + \sigma, \pi$ -conjugation. The decisive factor for phosphorochloride groups was  $\sigma, \pi$ -conjugation.  $\Sigma, \pi$ - and  $d, \pi$ -conjugation were comparable in all other cases. References 21: 14 Russian; 7 Western.

UDC 547.26'18

**Phosphorus-containing Crowns. XII. Complexing Properties of 14-Member Phosphorus-containing Crown-ethers With Regard to Metals Belonging to Subgroups IA and IIA**

18410365i Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 17 Mar 87) pp 1269-1273

[Article by A. A. Chaykovskaya, T. N. Kudrya, L. M. Tochilkina, and A. M. Pinchuk, Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] A systematic study examined the complex-forming properties of 14-member phosphorus-containing macrocycles and their noncyclic analogues and dibenzo-18-crown-6 with regard to Li, Na, K, Ca and Mg picrates in a nonpolar medium, and the effect of the features of the structure of these compounds on their cation-combining capacity was studied and discussed. Electron-donor atoms of the phosphoryl group and the polyether ring participated jointly in the combining of Li, Na, K, Ca, and Mg picrates by 14-member phosphorus-containing crown-ethers. Substitution of the phosphoryl group by a thiophosphoryl group decreased the cation-combining capacity of the macrocycles to cations of the IA and IIA subgroups. Figure 1; references 13 (Russian).

UDC 547.1'118

**Reactions of Ethers of Thioacids of Trivalent Phosphorus With Aldehydes and Ketones**

18410365j Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 4 Dec 86) pp 1273-1288

[Article by V. A. Alfonsov, I. S. Nizamov, S. A. Katsyuba, E. S. Battyeva, and A. N. Pudovik, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, USSR Academy of Sciences, Kazan Branch]

[Abstract] A study showed that ethers of thioacids of trivalent phosphorus react with aldehydes and ketones with splitting of the P-S bond and formation of products having a  $\alpha$ -(alkylthio)alkylphosphonate and  $\alpha$ -thiophosphonate structure. Introduction of hydrogen chloride into the reaction mixtures hastened the course of these reactions. References 37: 27 Russian; 10 Western.

UDC 547.26'118

**Interaction of Bis-dithiophosphonic Acids and  $\alpha$ -Quinones**

18410365k Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 16 Jul 86) pp 1288-1292

[Article by G. A. Kutyrev, O. S. Korolev, E. G. Yarkova, O. Ye. Lebedeva, R. A. Cherkasov, and A. N. Pudovik, Kazan State University imeni V. I. Ulyanov-Lenin]

[Abstract] This article discusses a study of reactions of bis-dithiophosphonic acids with 1,4-quinones. The possibility of dithiophosphonate-thiophosphonate regrouping

in these processes is also explained. Bis-dithiophosphonic acids form adducts having a 1:2 composition with 1,4-dibenzoquinones and 1,4-naphthaquinones. Upon heating, these compounds are isomerized on account of the S to O migration of the triphosphoryl group into apposite bis-[O-phenyl(naphthyl)thionephosphonates]. References 4: 3 Russian; 1 Western.

UDC 547.26'118

**Interaction of Diphenylisocyanate Phosphite and Dimethylalkinylphosphonites With Diphenylcarbodiimide and N-(2,2,2-trichloroethylidene)acetylamine**

18410365l Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 9 Dec 86) pp 1292-1295

[Article by L. V. Konovalova, Yu. G. Trishin, L. A. Burnayeva, E. K. Khusnutdinova, V. N. Chistokletov, and A. N. Pudovik, Leningrad Technological Institute imeni Lensovet]

[Abstract] A study of the interaction of diphenylisocyanate phosphites and compounds containing a C=N bond showed that diphenylisocyanate phosphite reacts with diphenylcarbodiimide and N-(2,2,2-trichloroethylidene)acetylamine; this results in the subsequent formation of products having a dimer structure and containing a diazaphosphetidine cycle with a penta-coordinated phosphorus atom. The interaction of the dimethyl ethers of 1-propinyl- and 2-phenylethynylphosphonous acids with diphenylcarbodiimide formed substituted phosphabicycloheptenes. Hydrolysis products of intermediate phosphoranes (substituted trichloroethylphosphinates) were isolated in reactions of dimethyl ethers of 1-propinyl- and 2-phenylethynylphosphonous acids with N-(2,2,2-trichloroethylidene)acetylamine. References 9: 8 Russian; 1 Western.

UDC 547.794.2'118

**Aminoalkylation of 1,3,2-Oxazaphosphorinanes**

18410365m Moscow ZHURNAL OBSHCHEY KHIMII in Russian Vol 58 No 6, Jun 88 (manuscript received 8 Jul 87) pp 1444-1445

[Article by S. A. Terentyeva, M. A. Pudovik, and A. N. Pudovik, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, USSR Academy of Sciences, Kazan Branch]

[Abstract] It has been reported that oxazaphosphorinanes with the phosphorus atom having an alokoxy or aryl group are aminoalkylated by an endocyclic nitrogen atom with formation of representatives of a new class of compounds, cyclic N-phosphorylated amins. These combine with sulfur to give apposite thionphosphates or thionphosphonates. The structure of the compounds has been confirmed by the use of nuclear magnetic resonance of its  $^{31}\text{P}$  spectra. References 1 (Russian).



**Urengoy Gas Cooler Scandal Exposed**  
*18410043a Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 29 Sept 88 pp 2-3*

[Article by V. Dolgova, procurator, General Inspection Department, Tyumen Oblast Public Procurator's Office, and G. Bazhutin, staff correspondent: "They Bought, Celebrated, Understood, and Wept: The Story of a Contract"; first paragraph is a boldface SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] "The GCS [gas-cooling stations] again?" asked Rem Ivanovich Vyakhirev, first deputy minister of the USSR Gas Ministry, throwing up his hands with sincere bewilderment. "I don't understand what else there is to find out. Yes, negligence with the imported equipment was permitted. But we have investigated everything. The documents will convince you: Fines, as stipulated, were paid, and stations are now being built. So, I think, we are now correct in considering the matter closed...."

Both the documents and the deputy minister's words were quite convincing. We thought that had our conversation taken place at the beginning of the investigation of this story we would have been satisfied. But afterward there were dozens of meetings with workers and engineers at the Urengoygazdobycha Association, with Ministry of the Gas Industry specialists, before whose eyes government funds were squandered on a scale unheard of even in Tyumen.

No, there is no way we can agree with comrade Vyakhirev. It is too early to close "the case of the GCS," as gas-cooling stations are called there. Quite the contrary, it is really only just beginning.

But let's tell everything in sequence. Once some strange cargo arrived at the Sibtsentr and Farafontyevskaya bases, which serve the Novyy Urengoy enterprise. Hundreds of huge wooden crates with foreign labels. And no documents. What? Where? Why? Nothing was clear. Moreover, in the commotion of the huge construction project, base workers were too busy to rack their brains on this puzzle. They decided to unload the crates off to the side and to let whoever ordered them figure it out.

But weeks and months passed, and no one claimed them. Then new railcars arrived with these strange shipments. To avoid cluttering the base, they had to be dragged off to different sites.

Let us say immediately that they treated the shipments rather unceremoniously. They broke quite a few crates and even threw them into the tundra. They got rain soaked and snow covered. Something cracked loudly in the subfreezing nights. The crates lay unprotected, so any curious passerby could "check out" their contents.

Suddenly, a storm out of the blue sky—a commission from the Urengoygazdobycha Association.

"Somewhere you must have some custom French equipment with displays, each electronic. Let's see how it's stored...."

"An explanation—a theoretical digression—is required here. Gas from the depths of the Earth arrives hot. At the Novyy Urengoy field its temperature reaches plus 20 to 25. Upon entering a gas line, the gas loses its heat to the environment. But it is surrounded by permafrost, which begins to thaw because of the heat. The gas line that has been laid in rock-hard frozen soil can quickly end up floating in a swamp.

How does this affect a steel pipeline? Don't insidious cracks form? Won't accidents begin to happen? These concerns arose among Ministry of the Gas Industry specialists when they began to develop fields located in the permafrost zone.

The following solution was proposed. Before gas enters the pipe, its temperature should be reduced to subzero. This was how they proposed to preserve the frozen ground. In addition, one other additional effect was anticipated. Reducing the amount of volatile fuel through cooling would increase gas line capacity in summer. Admittedly, not by much, a few percent, but it's something.

These ideas, which are basically supported by theoretical arguments, were set forth in a report presented to V. Dinkov, then Minister of the USSR Gas Industry (now Minister of the USSR Petroleum Industry).

Let us say from the outset that this idea had its supporters and opponents. In particular, the Urengoy gas field workers took it upon themselves to point out that there was not one main pipeline in the Tyumen North laid in a swamp. They run along lines of frozen ground and there is no problem. They perform for years. There is no reason to pump extra gas into the gas lines in summer. The national economy's fuel demand drops sharply at that time of year, and gas recovery associations cannot possibly sell their output.

We will not take sides now. We hope that competent agencies will speak up. But the Urengoygazdobycha specialists' idea seemed entirely valid. Such a large-scale project demanded much more basic research and studies involving local scientists and the gas field men themselves.

The opponents' proposals, they say, were also sent to the ministry, but got lost somewhere in the dark corners of the branch headquarters. Then departmental institutes got an order: Prove it. So they did. As a result of their joint efforts, Saratov's All-Union Scientific Research Institute for Gas Recovery [VNIIGasdobycha] and the Donetsk Southern Scientific Research and State Planning Institute for the Gas Industry [YuZhNIIGiprogaz] came up with a plan to build six high-power gas-cooling stations at the Novyy Urengoy field. Because of the great

urgency of these projects, it was proposed that the equipment for them be ordered not from domestic enterprises, which don't have the experience producing these gas "freezers," but abroad.

This document, signed by A. Shatalov, chief engineer of the Gas and Gas Condensate Recovery Administration of the Ministry of the Gas Industry proceeded to the approval stage with enviable speed. In only one place did they "forget" to get it approved—the association for which these GCS were to be ordered. No one found the time to send the scientific-technical studies on station construction developed by the institutes.

A contract for a huge sum, 146 million foreign currency rubles, was signed with the French consortium Creusot-Loire.

Several months later the consortium reported that the first lots of equipment were ready, and it invited Soviet representative to inspect and accept them for shipment.

Obviously there is no need to explain how eagerly Ministry of the Gas Industry personnel responded to this invitation. Exactly how many people and who spent 3 years in France while deliveries were being made? This information was unobtainable. The Ministry of the Gas Industry keeps it like an important state secret. But we know precisely that the experts included only one representative of the association. He was sent abroad after the rest and had only very modest, narrowly specialized authority related to the acceptance of electrical equipment.

"There were no irregularities in the makeup of the purchasing and acceptance commissions," the ministry reported to us. Perhaps so. But one can say with confidence that, if Urengoy gas field men had been on the commissions, the fate of the gas coolers would have been different.

And how did these high-ranking so-called "specialists" occupy themselves abroad? One can only guess what ideas guided ministry and Soyuzarubezhgazprom and Mashinimport Association personnel who watched over these deliveries like "mother-hens, and even that isn't easy.

Let us present just a few of the questions that, quite rightly, the indignant Urengoygazdobycha men are asking. Why, when ordering equipment requiring extra-careful storage at above-zero temperatures, didn't anyone think to set aside funds and define quotas for building the bases, for constructing new, capital warehouses? How did it turn out that no one informed Novyy Urengoy beforehand about the deliveries? Whose brilliant idea was it to put expensive cargo in puny wooden containers that could not survive shipment through tundra wilderness or protect the equipment from precipitation and destructive polar cold? Who arranged to pack the equipment in containers without sorting. As a result,

now, in order to assemble one unit, you have to open up to a hundred crates, sort out the contents in the wind and frost, and bring in extra people to do it. ("This was done to save money," explains the ministry. So be it. However, our specialists displayed a strange kind of thriftiness in this matter. They saved money on packing and sorting and, along with the equipment, in France bought concrete plates, iron beams, and many other parts that only differ from domestic ones in price.) Who failed to ensure that, insofar as possible, the equipment ordered was manufactured in compliance with Soviet GOSTs? You see, even the sockets for signal lights, of which there are thousands in each station, are of a gauge different than our standards. Now, to replace a bulb you have to buy it abroad for five times the price. And finally, who and in whose name accepted stations with hundreds of meters of unusable pipe, with clearly substandard transformers?

These questions are still unanswered. But it is clear that the total loss is in the millions.

However, all this would not have had such a ruinous effect if the equipment had immediately come to the site. You see, the consortium guaranteed assistance with installation, start-up and adjustment, replacement of substandard parts, and delivery of additional equipment under preferential conditions. But there was no one to build the stations....

"The Urengoy Main Construction Administration [Glavurengazstroy] bears the entire blame," reports the Ministry of the Gas Industry. "It never wanted to undertake the stations."

"That is what we call passing the buck," they say indignantly at the northern main administration. "Look at our plans, our production indicators."

We looked. And were convinced that the main administration couldn't fit the GCS into their more than tight schedule, made up, in addition, of orders from the same Ministry of the Gas Industry, for several years. The 1985 delivery date for all six GCS initially set by the Ministry can, with complete certainty, be called risky.

To be honest, it's unbelievable that those who set this deadline failed to realize this. And if they did, why then did they write it into the state plans? To justify the contract? And at the same time shift the blame for not using the expensive equipment to another department?

For about 2 years the squabbling continued between the Ministry of the Gas Industry and the Ministry of Construction of Petroleum and Gas Industry Enterprises. Finally, the foundations for five of the six stations were laid. (Looking ahead, we will say that the sixth station turned out to be unnecessary. It turned out that they had failed to calculate that there was simply no place to build it.)

At that the Ministry of the Gas Industry was also satisfied, and the matter went on so-so.

In 1984, 10 percent of the planned scope had been completed. In 1985, 17 percent. In 1986, a little less than 50 and 1986, 62 percent.

When they finally began installing the equipment, the contract and guarantees had expired. So, to the considerable astonishment of the French partners, the association had not taken advantage of its legal rights and had not made a single claim against them.

Out of its honestly earned income it paid huge fines (totaling about 20 million rubles), without a murmur, "for inefficient use of equipment." And no one sounded the alarm, no one required immediate evacuation of the valuable cargo, no one complained to law enforcement agencies or to the press about the ministry's inaction.

Somehow, V. Zavyalov, head of the outfitting department of the Tyumengazsnabkomplekt Trust, rode by these dumps of imported equipment. Horrified by what he saw, he prepared a thorough report that was sent to the Glavtyumengazprom. But this document lay untouched in the file. Admittedly, the bases got instructions to make holes in the crates.

It seems that a sort of zone of cautious silence reigned around the GCS. Everyone tried to avoid them, and—as it turned out—not without good reason.

The storm burst when a commission of the USSR Committee of People's Control arrived at the Urengoy bases for regular inspection.

The thunder roared and lightning flashed with righteous wrath at Ministry College meetings. Whom did they punish? The deputy general director of the association, V. Polivanchuk, was removed from his post, to which he had been assigned shortly before, and the assistant chief bookkeepers at the association and the bases were disciplined. And that's where it ended.

"But now construction of the GCS is underway," they tried to admonish us at the main administration and the ministry. "Why inflame passions? Do you really want to punish yet another head?"

We honestly admit that we do. Not just "another," but all those who are truly guilty. Not only for the "errors" of the past, but for today's procrastination. For example, GCS-I, if its construction continues at the same pace, won't even be commissioned in the next five-year-plan. Its equipment lies, as before, in the open. The extra GCS is lying in "transit" behind a symbolic mesh fence. Admittedly, after a miraculous conversion performed at the Ministry of the Gas Industry by Deputy Minister P. Vyakhirev, it's no longer simply unowned equipment costing 14 million rubles, but a civil defense reserve (?).

"If they take a box of nails from the site, it's called theft. They shout 'Catch the crook!' But if they drag a whole association into economic fraud? If they take millions from its account, they call it ministry policy. There is no one to catch and nothing to judge."

These bitter words, heard at the GCS construction site, have their own sort of formula for the ailment that recently struck our economy. It spread with particular speed in the years now called stagnant. Under the beneficial conditions of mass hoodwinking and the absence of glasnost it spread like cancer to all spheres of the national economy. It seems that we do not even realize the scale on which it has spread or the harm it has done. The name of this ailment is professional negligence. This sickness is so virulent that the revolutionary changes of our time are nothing against it. The introduction of full cost-accounting helps strengthen production and worker discipline and raise the level of efficiency among managers and the quality of their work. But all this is on the lower levels, in the shops and enterprises....How does this affect negligent personnel at the middle and upper echelons of economic management? The whole point is that it does not. Cost-accounting is not enough. As paradoxical as it may seem, full cost-accounting has created favorable conditions by eliminating many obstacles of state and another kind of supervision.

Theoretically, the enterprises themselves must now be the inspectors. A new law has been put into their hands. There are only a few managers who take the suicidal step and stand on the letter of this law. You see, in practice this means that he must begin a war with the higher organization's apparatus, and in the complete and wholehearted conduct of this war, the manager's quotas, resources, and relationships with suppliers are at stake. Should we be surprised that production workers are ready to resort to violations and bargain with their consciences to cover up the "miscalculations" and "omissions" of the main administrations and ministries. There is a mountain of evidence for this in the North at Tyumen.

It is especially alarming that many have finally come to believe in the inevitability of this state of affairs. Beyond a shadow of a doubt, pointing somewhere downward, Rem Ivanovich Vyakhirev explained that the whole matter was that managers and specialists on lower levels do not know how to work. So, at Novyy Urengoy, they cannot deal with a complicated situation, and now they are still complaining, the cranks! Without a shadow of hope for the restoration of justice we learned the entire story at the association. ("Nevertheless, the Ministry will protect its own. They'll look for 'scapegoats'.")

No, one can't count on a self-cure within the department. Intervention from outside is needed. It probably requires a whole set of nationwide economic and legal measures that will actually make a manager's poor performance disadvantageous for him personally and force him to pay for his sins himself.



But this does not eliminate the need to simply catch careless people and make them—no matter whom—accountable, including legally.

"So what's the matter?" the reader probably says, looking at one of the signatures under this correspondence. "Catch them. Bring them in."

"We're trying. But each grain of truth in these matters is so difficult to obtain, especially if an investigator from a peripheral procurator's office so much as dares to show himself at the ministry. On the other side is the guarded mistrust of local Party and Soviet agencies traditionally fearing that someone will make waves...

They encountered all this in the GCS case. All possible measures of procurator reaction have been taken. But will they be sufficient? Will it be able to pull out the entire multilink chain of professional irresponsibility, to get to its root? Sensibly evaluating its strengths, we must admit that we are not sure....

As we were completing the last lines of this report, the telephone rang at the correspondents' office.

"Is it you who are working on the GCS? I want to tell you something."

"Perhaps you'll introduce yourself first?"

"No. If my bosses find out that I had talked to you, I would lose my job. Or worse. I must tell you the following. The GCS now being built cannot be started up. It's too late. The frozen ground under the gas lines has already thawed. If they freeze the gas line, it will burst. If you don't believe me, check the reports at the Novourengey Geological Engineering Monitoring and Research Trust.

We inquired at the Trust.

"Yes, the ground under the gas lines has thawed 20 meters down," confirms V. Antonov-Druzhinin, head of the Geotechnical Systems Laboratory. "It's hardly possible to restore it. It is truly very risky to freeze pipe under these conditions."

"Can someone now give a more definite answer?"

"Hardly."

"Can't either the ministry or the main administration give anyone the task of doing a basic study of the use of GCS in a changing geotechnical situation not foreseen in the project?"

"As far as I know, no...."

**Start-up of Central Asian Gas Field Development**  
*18410043e Moscow SOTSIALISTICHESKAYA*  
*INDUSTRIYA in Russian 7 Oct 88 p 2*

[Article from TASS, datelined Mary: "Production Capacities Rose"]

[Text] The command "Start!" resounded at Central Asia's largest gas condensate field, Sovetabads. The first start-up complex of the second lead facilities with a capacity of 5 billion cubic meters of gas annually was put into operation.

The Shatlykgazstroy Collective was aided by fitters from many cities all over the country. At the top of the 120-m tower, the flag of the Socialist Republic of Romania flies next to the Soviet flag. By an agreement under the CEMA, envoys from the fraternal country are participating in developing this field in the Karakum. Several important aspects of the start-up complex were built by a collective of Rumanian subcontractors. Many mistakes made in the development of several of the country's major fields were avoided during construction. Absorbents combining the process of sulfur cleaning and gas drying have been used for the first time at Sovetabad. They are also concerned about training skilled personnel who will run the complicated equipment. Experience has been gained at similar fields in this country.

UDC 662.749.3:665.7.032.56

**Yield of Chemical Coking Products**  
*18410349a Moscow KOKS I KHIMIYA in Russian*  
*No 6 Jun 88 pp 29-30*

[Article by N. A. Turik, N. F. Alekseyeva, and M. S. Babenko, Donetsk Coking By-product Plant]

[Abstract] A laboratory method of coking small weighed quantities of coals to determine the yield of chemical products was described and discussed. The method is now being used at the Central Scientific Research Coking Laboratory of the Donetsk Coking By-product Plant. Coals from the Donetsk, Lvov-Volyn, Kusnetsk, Karaganda, and Pechora basins that are used at coking by-product plants in the Ukraine were studied. An increase in the yield of volatile matter increased the yield of chemical coking products with significant variations for one and the same grade of coal. Increasing the yield of volatile matter by changing the charge composition did not always increase the yield of chemical products. Use of this laboratory method made it possible to determine chemical coking products, compare them from the standpoint of chemical potential, and explain why they are lost during production.

UDC 678.746.525:661.47

**Reaction of Vinylpyridine with Iodine**  
18410008b Ivanovo IZVESTIYA VYSSHIKH  
UCHEBNYKH ZAVEDENIY: KHIMIYA I  
KHIMICHESKAYA TEKHOLOGIYA in Russian  
Vol 31 No 6, Jun 88 (manuscript received  
8 Jul 87) pp 36-38

[Article by L. B. Zubakova, A. B. Zhovnirovskaya, M. P. Osokina, and L. B. Korkh, Chemical Technology Institute imeni D. I. Mendeleev, Moscow]

[Abstract] Vinylpyridines and their polymers react with halogens to form polycomplexes that may be used industrially. Of great interest is the capability of 2-vinylpyridine to polymerize in the presence of iodine without initiators or catalysts. The initial components are combined in a definite proportion and maintained for a given time at a fixed temperature. The polycomplex is separated by dissolving in acetone and precipitation in ethyl ether. In the present work optimum conditions for conducting this reaction were determined by mathematical planning. Formation of the polycomplexes was confirmed with infrared spectroscopy, and the intrinsic viscosity at 25°C was determined. The polycomplexes are stable at temperatures up to 150°C. Figures 2; references 4 (Russian).

UDC 678.5-148:547.07:539

**Spatially Cross-Linked Hydrogel Polymers**  
18410015a Moscow PLASTICHESKIYE MASSY in  
Russian No 8, Aug 88 pp 4-7

[Article by O. V. Suberlyak and A. I. Sochko]

[Abstract] Reticular polymers based on oxyalkaline methacrylates with highly stable physicochemical properties and chemical stability following repeated sterilization in boiling water and washing in alcohol have been used for the manufacture of biopolymer products. Graft copolymers of this material with polyvinyl pyrrolidone have superior permeability and immobilization activity. This article studies the possibility of regulating the structure and properties of such copolymers. The data obtained indicate that the copolymers are easy to synthesize and that it is easy to produce hydrogel films of the copolymer. A new approach is suggested to explain the reaction mechanism in view of the variation in copolymer formation rate as a function of intensity of the physical interaction between the monomer and graft copolymer. The increase in polymerization rate when the graft copolymer is present apparently results from a matrix effect in which the molecules of the monomer are solvated by the polymer matrix. Hydrogel membranes thus produced are found to be suitable for long-term utilization in hemodialysis and blood filtration, for the lining of artificial blood vessels, and in other cases in

which the membrane contacts blood. The superior strength of films based on the copolymers recommends them well for ultrafiltration. Figure 1, references 13: 12 Russian, 1 Western.

UDC 678.743.4.029.72:66.085.3

**Influence of Climatic Aging On PTFE Radiation Resistance**  
18410015b Moscow PLASTICHESKIYE MASSY in  
Russian No 8, Aug 88 pp 17-19

[Article by Ye. A. Barbashev, N. A. Birkina, A. V. Zakharchuk, N. I. Konkin, V. Ye. Kudryashov, A. M. Kuznetsova, T. M. Provotorskaya, and Sh. T. Tuychiyev]

[Abstract] A study examined the influence of exposure to the weather on the radiation resistance of commercial films based on polytetrafluoroethylene 30 and 80  $\mu\text{m}$  thick. Specimens were exposed in warm, moist; temperate, cool; and temperate, cold, and moist areas. Next, they were bombarded in air with 600 keV electrons and 1.25 MeV  $^{60}\text{Co}$   $\gamma$ -radiation. Climatic aging of the polymer was found to cause the appearance of new absorption bands in the 400-900  $\text{cm}^{-1}$  area that corresponded to the amorphous phase and defective polymer chain areas resulting from conformation conversions. Weathering thus primarily decreases the degree of order of the polymer chains and causes conformation conversions. Radiation treatment of PTFE after weathering causes the structural parameters of the polymer to change symbatically with the increase in  $\epsilon$ . Radiation treatment after aging primarily causes recrystallization, which in turn causes a monotonic decrease in  $\epsilon$  at doses of up to 10 kGy. It was found that there is a maximum degree of climatic PTFE aging and that the radiation resistance of the polymer changes after this maximum weathering is reached regardless of the atmospheric conditions of aging, indicating that the PTFE aging mechanism is the same under various climatic conditions. Figure 1, references 5: Russian.

UDC 678.742-19.01:539

**Influence of Structure on Properties of Polymer Composites Based on Mixtures of Polyolefins**  
18410015c Moscow PLASTICHESKIYE MASSY in  
Russian No 8, Aug 88, pp 20-21

[Article by S. A. Komarov, S. F. Levochkin, Ye. Ye. Piskunova, A. A. Kolesnikov, V. N. Kuleznev, and B. P. Yerykhov]

[Abstract] A study examined the influence of composition in high-pressure polyethylene plus trinary ethylene-propylene raw rubber mixtures on the crystallinity, loss of long-range order of polyethylene crystalline phase, polymer matrix microdefect content, type of colloidal structure of the mixture, shear modulus of elasticity, mechanical loss angle tangent, and physicomechanical

properties of the films. The primary objective of the study was to determine the interrelationship among the individual structural and mechanical parameters. It was found that the strength and elasticity of the mixtures depend on a number of the structural parameters. Each of these parameters has different effects on the individual properties, these effects being determined by the peculiarities of the mixture's colloidal structure. Their overall effect is manifested as a change in the structure and density of the physical angles of the molecular grid, which can be used to predict the strength properties of multicomponent polymer mixtures. Figures 2, references 10: Russian.

UDC 678.742.2.541.144.8:547.567.2

**Quinone-Sensitized Photooxidant Modification of Polyethylene Surface**

18410015d Moscow PLASTICHESKIYE MASSY in Russian No 8, Aug 88 pp 21-23

[Article by A. A. Dalinkevich, S. G. Kiryushkin, F. V. Shemarov, and Yu. A. Shlyapnikov]

[Abstract] A study examined the influence of various quinones on the adhesion of polyethylene upon modification of its surface by photooxidants. Low- and high-pressure polyethylenes were studied and the degree of their crystallization determined by IR spectroscopy. A search was made for the simplest, least ecologically harmful method of modifying the polymer surface when using photooxidation sensitizers. It was found that photosensitized oxidation of the polyethylene surface in combination with traditional plastic processing methods can expand its area of application. UV irradiation of a sensitized high-density polyethylene layer increased the shear strength of the adhesive bonds produced more rapidly than with individual low-pressure polyethylene specimens. By varying the content of sensitizer, UV radiation intensity, and time, it is possible to produce joints with any desired adhesion strength. Figures 2, references 10: 9 Russian, 1 Western.

UDC 678.686:536

**Low-Temperature Flexibility of Epoxy Polymers**

18410015e Moscow PLASTICHESKIYE MASSY in Russian No 8, Aug 88 pp 23-24

[Article by I. S. Stepanova, V. A. Lipskaya, V. F. Stroganov, L. V. Zhuravleva, I. B. Tynyankina, and A. M. Cherevatskiy]

[Abstract] This study examines the deformation-strength properties of epoxy sealing polymers based on epoxy ester block oligomers and oligoester-urethane diepoxies at -15 to +50°C. Studies were performed on the condensation product of oligodiethylene glycol sebacinate with epoxy diene resin type ED-20, the epoxidized condensation product of toluylene diisocyanate and polyfurite and the product of its modification with glycidol. The

oligomers were cured with triethylene tetraminophenol at 20°C for 7 days. The tensile strength and relative elongation at rupture, equilibrium modulus of elasticity, and free volume fraction were determined. Polymers based on oligoester urethanes were found to have good deformation and strength properties at low temperatures as a result of the good usage reliability of the sealants produced at -50 to +50°C. Figures 2, references 6: 5 Russian, 1 Western.

UDC 678.5:62-229.88:621.928.028.4

**Use of Antistatic Material in Gas Cleaning Filters**

18410015f Moscow PLASTICHESKIYE MASSY in Russian No 8, Aug 88 pp 46-47

[Article by O. A. Dmitriyenko, L. A. Yenikova, T. V. Koroleva, and G. A. Safina]

[Abstract] The most promising method for protecting sleeve filters from static electricity buildup is that of using antistatic filter fabrics, metallized fabrics, materials treated with surfactants to increase surface conductivity of the polymers, and materials containing metallic fibers. Antistatic filter materials have now been developed that consist of nonwoven needle-punctured material with good dust-trapping capacity and good antistatic properties. The material is made of glavsan stable fiber, polyester fiber, polypropylene fiber and chrome-nickel steel fiber 30 µm in diameter cut into 50-mm sections. The material can be regenerated after filter use. The service life of filters made from the material is 2.5 times longer than that of filters made of non-anti-static lavsan material. References 5: Russian.

UDC 678.5.002.2:621.564.27

**Use of Nitrogen To Prevent Formation of Explosive Mixtures**

18410015g Moscow PLASTICHESKIYE MASSY in Russian No 8, Aug 88 pp 47-49

[Article by I. I. Strizhevskiy]

[Abstract] Nitrogen can be used to displace oxygen and improve safety in many processes in which explosive mixtures may be formed. It is suggested that air separation plants generating oxygen for use in the steel industry be utilized to produce large quantities of nitrogen. This nitrogen could then be liquefied and transported by pipelines to plants needing nitrogen to reduce the danger of explosive mixtures. In processes involving the pouring of large quantities of liquid chemicals into storage containers, large volumes of vapor are formed. An installation has now been developed to trap the vapor by its condensation with liquid nitrogen. It consists of several heat exchangers and a condensate collector. The installation operates automatically, maintaining the nitrogen slightly above the freezing point of the vapors to be trapped. A centrifugal liquid-nitrogen pump has been developed that has a 30-mm-diameter impeller directly



mounted on an electric motor shaft and features a maximum throughput of 1 ton of liquid nitrogen per hour at 0.78 MPa. The use of an inert gas such as nitrogen is the most reliable means of protection from the danger of explosion. Figure 1.

UDC 678.5:547.361:628.543.3

**Recovery of Allyl Alcohol From Allyl Monomer Production Wastewaters**

18410015h Moscow PLASTICHESKIYE MASSY in Russian No 8, Aug 88, pp 49-51

[Article by N. V. Dzumedzey, T. A. Menshikh, and N. N. Aleksyev]

[Abstract] This article reports a study of the physical and chemical regularities of azeotropic fractional distillation of allyl alcohol from allyl monomer production wastewaters in order to develop a process for allyl alcohol recovery. The equilibrium vapor-liquid system in production wastewaters was studied in order to determine the reflux ratio at constant pressure and compute the theoretical degree of separation of allyl alcohol at various temperatures. Laboratory studies of the production of allyl alcohol by fractional distillation of allyl monomer production wastewaters were performed on a batch-operation fractional distillation column 1 m high and 12 mm in diameter that was packed with glass spirals 2.5 mm in diameter. Heteroazeotropic fractional distillation of allyl alcohol was also studied by using toluene as the separating agent. The studies were used to develop a technological plan for allyl alcohol recovery including fractional distillation. The distillate is collected and extracted, and the still residue is further purified. After extraction, the phases are separated in a settling tank, the water is washed, and the extract is sent through a distillation unit and condenser to a collector. Benzene is repeatedly used for extraction. The still residue contains anhydrous allyl alcohol. Figures 2, references 4: 3 Russian, 1 Western.

UDC 543:541.183.123:541.49

**Comparison of Sorption Ability of Heterochain and Grafted Aminocarboxyl Polymers**

18410078k Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 39 No 10, Oct 88 (manuscript received 11 Dec 87) pp 2617-2621

[Article by G. I. Tsizin, G. I. Malofeyeva, O. M. Petrukhin, G. A. Yevitkova, D. P. Sokolov, I. N. Marov and Yu. A. Zolotov, Institute of Geochemistry and Analytical Chemistry, imeni V. I. Varnadskiy, USSR Academy of Sciences, Moscow]

[Abstract] Sorption potential of grafted and heterochain aminocarboxylic sorbents was analyzed with respect to a series of radionuclides:  $^{60}\text{Co}$ ,  $^{65}\text{Zn}$ ,  $^{54}\text{Mn}$ ,  $^{51}\text{Cr}$ ,  $^{45}\text{Ca}$ ,  $^{90}\text{Sr}$ , and  $^{204}\text{Tl}$ . It was shown that the heterochain

sorbent AN-31M exhibited higher sorption potential than the grafted iminodiacetate sorbent Dowex A-1. EPR data obtained on the sorption of copper on AN-31M showed that, depending on the conditions of the process, copper forms a number of complexes including one in which all six sites in the coordination sphere are occupied by the sorbent heteroatoms. On Dowex-1 such a coordination polyhedron is formed by copper only upon removal of water and with heating. High sorption potential of AN-31M toward other metals was noted. Figures 3; references 11: 9 Russian (1 by Western author), 2 Western.

UDC 678.55(775.8)

**Adsorption of Polyester and Polyorganosiloxane on Modified Fly Ash**

18410376a Kiev UKRAINSKIY KHIMICHESKIY ZHURNAL in Russian Vol 54 No 7, Jul 88 (manuscript received 13 Oct 86) pp 693-695

[Article by A. A. Pashchenko, V. A. Sviderskiy, I. I. Chirikalov, and N. V. Merezhko, Kiev Polytechnical Institute]

[Abstract] The effect of fillers modified by polyethylhydride siloxane on the adsorption of different kinds of polymers, especially adsorption-active and -inactive polymers, was studied by investigating unsaturated polyester resin PN-1, polymethyl phenylsiloxane lacquer KO-923, and fly ash from thermal electric power plant electric filters. Varying the degree of modification of the surface of the fly ash particles made it possible to regulate their adsorption interaction with the polymers studied and, therefore, the properties of the filled polymers. This is in contrast to ionogenic surfactants, which require individual selection each time. Figures 3; references 4 (Russian).

UDC 667.637.2

**Hardening of Methylolpolyamide by Ammonium Salts**

18410378a Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR: SERIYA B in Russian Vol 2, Feb-Mar 88 (manuscript received 20 Nov 86) pp 3-6

[Article by I. A. Lukoshyute and A. V. Kviklis, Institute of Physicotechnical Problems of Power Engineering, LiSSR Academy of Sciences]

[Abstract] A study of physicochemical changes occurring in methylolpolyamide during its hardening by ammonium salts involved introduction of salts from aqueous solutions in an amount of 8-10 mass percent into methylolpolyamide glue, PFE 2/10 type "P." Infrared spectroscopy and x-ray structural and thermal methods revealed that under normal conditions methylolpolyamide is hardened only by ammonium chloride and ammonium nitrate. Heat treatment at 393 K for 1 hour results in its hardening by

/ammonium sulfate and ammonium nitrate. Acids formed as a result of the interaction of ammonium salts and formaldehyde produced the hardening catalyst. Hardening

involved only the interstructural region in which the ammonium salts are concentrated and crystallized. Figures 3- references 5 (Russian).

UDC 541.15:547.8

**Radiation and Chemical Transformations of Dicyclohexyl-18-crown-6 in Aqueous Solutions**  
18410346a Moscow KHIMIYA VYSOKIKH ENERGIY  
in Russian Vol 22 No 3, May-Jun 88 (manuscript  
received 23 Oct 86) pp 203-206

[Article by A. F. Seliverstov and B. G. Yershov, Institute of Physical Chemistry, USSR Academy of Sciences]

[Abstract] A study of the interaction of dicyclohexyl-18-crown-6 and 18-crown-6 with primary products of water radiolysis by methods of pulsed radiolysis and electron paramagnetic resonance spectroscopy showed the high reactivity of crown-ethers in relation to H atoms and OH and O<sup>-</sup> radicals as well as their low reactivity in relation to hydrated electrons. The H atom and OH and O<sup>-</sup> radicals dehydrated crown-ethers without rupture of the cyclic structure but with the formation of a short-lived radical ( $\lambda_{\text{max}}=260$  nm). Secondary reactions of the radicals produced a breakdown in the cyclic structure. The radiation-chemical yield of the decomposition of crown-ether molecules in aqueous solutions was 0.6 for 18-crown-6 and 0.9 for dicyclohexyl-18-crown-6. The crown ethers in aqueous solutions underwent deep radiation and chemical transformations because of their interaction with ion-radical products of water radiolysis. Figures 2; references 6: 5 Russian; 1 Western.

UDC 541.15:66.096.268:678.746,527-547.91.3

**Radiation and Chemical Synthesis of Copolymers of N-Vinylpyrrolidone With Undecylenic Acid and Oleic Acid**  
18410346b Moscow KHIMIYA VYSOKIKH ENERGIY  
in Russian Vol 22 No 3, May-Jun 88 (manuscript  
received 23 Oct 86) pp 211-214

[Article by V. N. Ushakova, Ye. F. Panarin, V. M. Denisov, A. I. Koltsov, and A. A. Persinen, Institute of High-Molecular Compounds, USSR Academy of Sciences]

[Abstract] A study of the regularities of radiation copolymerization of N-vinylpyrrolidone with oleic acid and undecylenic acid in solution provided data concerning the structure and properties of the copolymers produced. The polymer yield and the rate of copolymerization depended mostly on the composition of the starting mixture. With a constant  $\gamma$ -radiation dose and a constant concentration of monomers in the starting mixture, the increase in level of oleic acid and undecylenic acid reduced the yield and level of links of the acid in the copolymer produced. The relative reactivity of oleic acid and undecylenic acid equalled zero, but the reactivity of vinylpyrrolidone calculated with consideration of the preterminal link equalled 0.61 [is less than]  $r$  [is less than] 0.94 for the vinylpyrrolidone-undecylenic acid system and 0.0 [is less than]  $r$  [is less than] 1.31 for the

vinylpyrrolidone-oleic acid system. Use of the method of radiation copolymerization permitted production of copolymers with higher acids. Figures 3; references 5: 4 Russian; 1 Western.

UDC 541.15:541.182.2/3

**Study of Resistance of Butoxy Aerosil to Effect of  $\gamma$ -Radiation**  
18410346c Moscow KHIMIYA VYSOKIKH ENERGIY  
in Russian Vol 22 No 3, May-Jun 88 (manuscript  
received 2 Jul 86) pp 221-224

[Article by N. N. Belov, Yu. S. Bogachev, V. A. Goldin, G. V. Lisichkin, A. G. Lyashenko, A. B. Rudakov, A. A. Serdan, G. A. Chernyayeva, R. R. Shifrina, and A. Z. Yankelevich, Physicochemical Scientific Research Institute imeni L. Ya. Karpov, Moscow State University imeni M. V. Lomonosov]

[Abstract] A study of the effect of  $\gamma$ -radiation on butoxy aerosil as a typical representative of silicas with a chemically grafted organic layer determined the change in infrared spectra and paramagnetic resonance spectra of butoxy aerosil upon irradiation of  $\gamma$ -quanta from a <sup>60</sup>Co source. The limit of resistance to the radiation dose of the chemical bonds between the silicic matrix and the grafted organic layer was determined, and the products of hydrolysis of the grafted layer after irradiation were analyzed by gas chromatography. The basic mechanism of the radiolysis of butoxy aerosil after small doses of irradiation was rupture of the chemisorption bonds. Increasing the irradiation dose resulted in radiolysis of the n-butanol. Figures 3; references 17 (Russian).

UDC 547.538.141:542.942.6

**Surface Photopolymerization of Styrene Under Effect of Laser Ultraviolet Radiation**  
18410346d Moscow KHIMIYA VYSOKIKH ENERGIY  
in Russian Vol 22 No 3, May-Jun 88 (manuscript  
received 25 Sep 86) 267-271

[Article by A. V. Shaposhnik, G. A. Grigoryeva, V. M. Matyuk, A. V. Polevoy, N. V. Kozlova, and V. K. Potapov, Physicochemical Scientific Research Institute imeni L. Ya. Karpov]

[Abstract] Deposition of polymer films from styrene vapors onto a metal surface under the effect of pulsed laser ultraviolet radiation ( $\lambda=266$  nm) was studied by using the piezoquartz microsuspension and infrared spectroscopy methods. The volumetric and surface channels of the reactions' initiations were discovered, and their contribution to the growth kinetics of the polymer films was assessed. The mechanism of surface polymerization included two channels of the process' initiation: (1) a surface channel along which active particles are formed on the substrate surface during interaction of radiation with the adsorbed molecules of the monomer and (2) a volumetric channel in which the active particles



form in the gaseous phase and, upon adsorption to the surface, initiate polymerization. Analysis of infrared spectra showed that the aromatic ring is not destroyed during

photopolymerization and that the reaction proceeds because of the opening of the double bond of the vinyl group. Figures 4; references 4: 1 Russian; 3 Western.

**Ministry Bureaucrats Delay New Cellulose Production Process**

18410043f Moscow SOTSTIALISTICHESKAYA INDUSTRIYA in Russian 6 Sept 88 p 1

[Article by Yu. Ivanov and L. Ioffe, candidates of technical sciences, Yu. Vorobyev, senior scientific associate, All-Union Scientific Production Association for the Cellulose and Paper Industry, datelined Leningrad: "Ministry Offices Are Destroying an Ecologically Pure Cellulose Production Process"; first two paragraphs are a boldface SOTSTIALISTICHESKAYA INDUSTRIYA introduction]

[Text] No one today needs to be told of the importance of ecological issues. We have actually reached the point where they are of equal rank with the nuclear threat. Our branch, paper and cellulose, has firm hold on the unfortunate position of first place among national economic sectors in many types of pollution. Every year combines producing paper and cellulose discharge 1.5 million tons of sulfur anhydride, hydrogen sulfide, chlorine, and other harmful substances into the atmosphere. And nearly every day the press writes about how much freshwater they devour, disfiguring nature with toxic discharges.

Speaking of the press, the development of glasnost has necessitated an increase in paper production. It turns out that capacities must be increased significantly, thereby—let's be consistent—increasing the ecological hazard as well. But how can it increase further! We have already put nature on the brink of disaster.

There is a way out, however. We are fully justified in stating this. Imagine the following. You have stepped out of an area with stuffy air and into a green grove where the air is suffused with oxygen. This is just about the sensation that we experienced when we completed development of equipment for a new process....

It has long since been proved theoretically that cellulose can be isolated from wood by using oxygen. The appropriate formulas were written and the calculations made. But the engineering for the task just did not come. Scientists in different countries struggled with it for more than a year.

Collectives at VNPObumprom, Leningrad, and the All-Union Scientific-Technical Institute for Inorganic Materials [VNIINM] in Moscow succeeded in finding a solution. The new cellulose cooking process was tested in laboratories and under experimental conditions. The following was discovered: if sulfur is replaced by oxygen, the resultant cellulose can be bleached without chlorine—and to a high whiteness at that. This means that, by eliminating one source of environmental pollution, we gain the ability to eliminate another equally hazardous source. To be brief, an ecologically clean process has been found.

It has been thoroughly tested and retested. Many years of experience with a continuous pilot cooking plant made it possible to develop raw data for designing a commercial plant. A Finnish company offered its services: equipment manufacture and installation. It promised to spend a year and a half on everything. But the help was rejected. The development was deemed national property.

M. Busygin, Minister of the Timber, Pulp and Paper, and Wood Processing Industry held a meeting to which we, the developers, were invited. We discussed how to put the innovation to use more quickly. It was decided to create a pilot plant at the Syask Cellulose Paper Combine, which stands on the bank of Lake Ladoga.

"How much time will it take?" the minister asked.

We answered that, considering the current procedure for ordering equipment in this country, it would take 3 years.

"No," the minister argued. "that's a lot. It has to be done in two."

We knew that not everything depended on us. The equipment is produced by enterprises in other ministries. Busygin also understood this. He picked up the intragovernment telephone decisively....

Immediately, literally within one day, he had managed to reach an agreement with the heads of the related branches and secure their approval. An order signed by three ministers—that of the timber, pulp and paper, and wood processing industries and those of chemical machine building and medium machine building. The order, which defined measures to accelerate development of the plant, was quickly issued.

Victory? Some victory! Departmental barriers were broken down before our very eyes. But we quickly understood that it was too early to celebrate. Those barriers had firm foundations capable of reproducing the parts destroyed just as a lizard regenerates its tail.

After the ministers had completed their deal, the "system" arrived on the scene. The faces of the managers from the Ministry of Chemical Machine Building's scientific production association Petrozavodskbummash unanimously displayed dissatisfaction when we presented them with documentation for the new process line. "But where are our approvals?" Since Mayakovskiy's time, the "communications department chiefs" have multiplied unbelievably and occupied key positions in the economy. We know this. But we hadn't assumed that these chiefs would be stronger than the minister. Without listening to a single argument they sent our brainchild along their customary path of approvals.

For example, citing orders, they required that we prove that the process line matched the world level. This was a purely formal requirement since we provided data that both the method and the equipment for cellulose production are patented in the United States, Canada, Japan, Sweden, and Finland. The development surpasses the world level, we said. They responded, "Splendid. Prove it."

We rushed to the head organization for cooking equipment, the Central Scientific Research Institute for the Cellulose and Paper Industry, and asked that a conclusion be issued. It took our machine building colleagues 4 months to thoroughly ponder this topic, after which they gave us their conclusion. At top speed, we sped to the equipment manufacturers with it. Their refusal to believe us was in vain.

They answered, "Yes, now everything is in order. But you are late, dear comrades. The deadline for equipment orders ran out 2 weeks ago. So come back next year."

Aren't these great methods to accelerate introduction of scientific developments? But does the Ministry of the Timber, Pulp and Paper, and Wood Processing Industry treat its "own" any better than do our colleagues from the Ministry of Chemical Machine Building? To speed things, Minister Busygin had made a decision that, as usual, was not approved beforehand by the main administration heads. Why did it need to be approved when everything was so clear? But bureaucrats obviously have a different logic. They fully demonstrated what it means to bypass them. P. Matveyev, head of the equipment and outfitting administration, put before us a modest requirement to get several more approvals—now on a second level. Other administrations did not miss the opportunity either, doing their own bits to drag out the affair.

What do we have as a result? A joint order from three ministers was signed at the end of 1987. It defined the deadline for plant startup—the end of 1989. But financing has not yet been made available, equipment has not

been ordered, and the construction contractor has not been selected. The operatives have made every effort to disrupt execution of the order. The diligence of V. Shamko, executive at the Ministry of the Timber, Pulp and Paper, and Wood Processing Industry, deserves special mention. With extraordinary stubbornness he proves that the Syask TsBK, which is now being rebuilt, has no space for the new plant. The old technology is now being improved, and therefore the new plant is not being written into the builders' work schedules.

There is nothing strange in Shamko's position. For many years he has geared the industry toward introducing exclusively imported equipment and technology. He is well known to many foreign companies that have blossomed considerably with his help—retarding the implementation of domestic developments. It is the branch's misfortune that it has an administrator who is convinced that no man is a prophet in his own country.

Ultimately, after numerous trips to the ministry offices of our own and related departments, we understood a simple truth: Despite restructuring, the chief function of the apparatus remains, as before, to prohibit, slow down, or do anything to keep the matter from developing or proceeding. The paradox is that no manager would even consider himself a retrograde! No, each is convinced that he conscientiously performs his duties and makes sure that no one violates instructions, regulations, rules, or GOSTs. He is so tied up with his own functions that he long ago became an element in the braking system without even realizing it. And there is no reason for him to ask himself why a Finnish company can arrange the start-up of a plant in a year and a half, while we, having promulgated a policy of dynamic scientific-technical development, are unable to manage the same in 2 years. What is stopping us? Who? Is it I, perhaps?

Having presented the documents, we enter the next ministry. Around us are very kind people, quite modern (judging by the cut of their suits). And it is pleasant to chat with them. They are all friends of the forest, rivers, and lakes. But we know the price of these words.



### Shortage of Chemical Preservatives for Livestock Fodder

18410038d Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 30 Sep 88 p 2

[Article by N. Golosov, instructor, Chemical Industry Section, CPSU Central Committee: "We Do Not Preserve What We Have"]

[Text] Year after year we see the same picture. As soon as the cold weather sets in, the good cattle feed situation quickly melts away, and by the middle of the winter many agricultural establishments, particularly those in the central and northwestern Russia, institute severe economic measures. Then, some time later, the agricultural managers, literally with tears in their eyes, ask for at least an armful of hay for their unfortunate livestock.

Livestock starvation is dealt with in many ways. In the days of serfdom, the peasants fed their cattle with wood bark, water plants, and steamed sawdust. Today livestock farms use mixed fodder, protein and vitamin supplements, etc. But in our enlightened age it is difficult not to ask what happens to the huge quantities of haylage and silage that is prepared in the summer. Is it not simpler to try to preserve the fodder that has already been harvested instead of developing new fodder substitutes such as wood chips treated with sulfuric acid? According to the managers themselves, this would guarantee a sufficient quantity of fodder to overwinter the cattle.

Indeed, about 300 million tons of silage is prepared annually in our country. However, at least one-third of this quantity should be treated with preservatives. For this makes it possible to preserve in the silage up to 90 percent of the nutrients and to save additional 30 to 40 feed units, five to six kilograms of digestible protein, 10 to 15 kilograms of sugar, and 15 to 20 kilograms of carotene per ton of silage. Currently, more than five million tons of sugar is lost annually alone in corn that is ensiled without preservatives.

Therefore it is no wonder that fodder prepared with the use of preservatives and with proper ensiling practice is usually a first-class fodder. The Ukraine and the Baltic republics have achieved good results in this area. The Stupino rayon farms in the Moscow oblast have placed fodder preservation on scientific footing, and the results were quick to show up. The productivity of the dairy herd, which, incidentally, is the largest in the Moscow oblast, increased by 20 percent and attained 3.8 tons of milk per cow.

It is also useful to consider the experiences in foreign countries. The effect of preservation of fodder can be particularly clearly illustrated by using Finland, for example. In that country, the production of silage was quadrupled in the last two decades. This has made it

possible to reduce the import of protein feeds by five-sixths. This, together with other factors (breed improvement and good care), has enabled the Finnish farmers to increase the per-cow milk production considerably. Analysis of the use of preservatives in Sweden and England yields a similar picture.

More than six decades have elapsed from the time of the Finnish scientist A. Virtanen, the father of chemical preservation of fodder, who, by the way, received the Nobel prize for this work. Virtually harmless ingredients are used for this purpose. In Finland up to 95 percent of fodder is preserved.

Why is it that in our country only about 10 percent of green fodder is treated each year with chemical preservatives? There is a chronic shortage of effective preparations. This is why we lose about 45 million tons of fodder.

The chemistry and forest products group of ministries have shown a lack of responsibility in their handling of the task of increasing the production of preservatives. The construction people have hindered the introduction of production facilities for these chemical products. So far the Minselkhovmash has failed to organize series production of equipment for mechanizing the addition of preservatives to fodder.

The scientific research organizations of the Ministry of Chemical Industry, the USSR Ministry of Petroleum Processing and Petrochemical Industry, the Ministry of Production of Mineral Fertilizers, and the All-Union Academy of Agricultural Sciences imeni V.I. Lenin are slow in their work on the development of new fodder preservatives and the technology of their production and use.

The problem is becoming more acute year after year. Let us cite some figures. In order to satisfy the demand for preservatives even minimally, their annual production should be not less than 380,000 thousand tons; however, this year agriculture received less than one-third of this amount. The reasons are always the same. The construction of facilities for the production of formic acid at the enterprises of the USSR Minkhimprom and benzoic acid at the enterprises of the USSR Minneftekhimprom has been slow. The plan regarding the deliveries of sodium pyrophosphate to agriculture from the Khimprom association in Sumy is not being fulfilled.

But even if all production facilities were miraculously operational and were to produce the planned quantity of preservatives, the problem would not by any means be solved. Where, for example, would the products be stored since to this day the suppliers prefer to ship in railroad tanks rather than in polyethylene drums? This is very inconvenient for users. Such a quantity of preservatives would not please the USSR Gosagroprom because it lacks facilities and equipment for receiving, storage, and transportation, not to mention equipment

for mechanization. What can one say about the manufacturers of agricultural machinery who so far have not been able to supply equipment for adding preservatives to green fodder directly during harvesting? Neither the branch's scientific establishment nor the industry has been able to develop the high-quality blends that have long been used by all governments that have advanced agriculture. And if we follow this path to the very end, we shall also see that not every user would be happy. For being able to treat green fodder with preservatives requires having preservatives whose prices are affordable. Also, in-ground concrete silos and films are needed to receive them. And all this requires extra expenditures, although experience shows that they pay for themselves in a year and a half to 2 years.

Then who would benefit from increased production of chemical preservatives? All of us, the entire nation. For an increased supply of rich, nutritious fodder will increase the production of meat and dairy products, and we shall have more meat, butter, and milk on our tables. Therefore our chemists and their suppliers should greatly increase their efforts.

**Session of Supreme Soviet Science and Technology Commission Criticized**  
18410043d Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 7 Oct 88 p 2

[Article by S. Panasenko: "Zero-Altitude Takeoff: Afterword to a Meeting of the USSR Supreme Soviet's Preliminary Commission on Science and Technology"; first three paragraphs are a boldface SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] "The results of the first semester indicate positive accomplishments. But there have still been no major improvements in science," stated A. Reut, first deputy chairman of USSR Gosplan, when assessing the current situation in his speech to the Preliminary Commission on Science and Technology.

The commission was meeting to produce unified proposals and comments on the draft of the State Plan and State Budget for 1989 on the basis of materials presented by ministries and departments. In view of the fact that the question of strengthening the role of science in restructuring had been posed at the 19th All-Union Party Conference, one might have expected that the conversation would be about radical transformations. But here is the plan of action that Gosplan proposed.

It is based on state orders for research and development in key areas of science and technology. These orders are to cover about 300 assignments.

The second unique feature of science for the coming year is that it will concern itself with financing special developments rather than with organization in general. The

third feature of the plan calls for expanding full cost-accounting in science. According to estimates from Gosplan experts, it should grow by about 34 percent.

S. Aleshin, deputy head of the USSR Ministry of Finance, put the Gosplan's plots into monetary form. The total scope of centralized investments in science is to increase from 32 billion rubles to 37 billion in the future. Of these, the Academy of Science will receive 2.2 billion. Plus another 1.8 billion for the development of experimental facilities. The scope of financing for specific programs will rise to 20 billion; for contract programs, it will climb to roughly 12.4 billion rubles.

Both of these speeches were made in the spirit of "cautious optimism." But the deputies were in no hurry to share it. They wanted to know whether the finances allocated were supported by appropriate resources. The attempts of Gosplan and Finance Ministry representatives to assure them that the plans are completely balanced were, unfortunately, unsuccessful. The deputies recalled that they had heard similar assurances before. But in the past fiscal year the Academy of Sciences had to return 25 million rubles to the State Bank for "undigested" capital investments.

The speech by V. Mikhaylov, USSR State Committee for Science and Technology [GKNT] representative, was different. He said that the committee intends to concentrate assets and resources on so-called state scientific-technical programs. There are slightly more than 1,500 of these covering problems such as high-temperature superconductivity, high-energy physics, and information science.

The main part of the speech ended on that point. And then it voiced genuine concern about difficulties impeding the acceptance of cost-accounting in science. The lack of interest from industry, the economic illiteracy of many scientific research institute and design office directors, fear of prices fixed by contract—all this creates an atmosphere of uncertainty. In addition, cost-accounting is still on a rocky road. As a result, the plans call for a reduction in the number of prospective projects at more than 80 percent of all scientific organizations.

The fact that the country risks being left without major breakthrough developments was confirmed by V. Pushnyak, deputy minister of Instrument Making, Automation Equipment, and Control Systems, and V. Yefimov, head of the Main Scientific-Technical Administration of the Ministry of Machine Building. "Plants do not and will not have money for science," they announced. "And there are not enough centralized ministry funds for the development of science and technology." Yet they demand an increase in the scope of state orders.

I. Makarov, chief scientific secretary of the Presidium of the USSR Academy of Sciences, also painted a thoroughly dismal picture.

"The planned 7 percent increase in expenditures for basic research is entirely inadequate. In the United States, this increase has so far averaged 11 percent a year. And President Reagan requested a 17 percent increase for the next fiscal year. Is it realistic to demand world-class output from our science with this figure?"

It turned out that departments responsible for scientific-technical progress did not put a single well-thought-out idea for acceleration before the commission. Instead, a set of quite traditional measures was proposed to the deputies. They did not hear a clear answer to the question of what these multibillion ruble investments and programs will bring the country and its science. The impression was that the speakers themselves did not have a very clear idea about this. They were more interested in an increase in allocations and investments than in the ultimate goal. The notorious planning based on "past achievement" clearly showed through the pale of numbers.

S. Aleshin expressed the central departments' genuinely resolute position. When he was again reproached because the Finance Ministry is ignoring decisions on the priority development of basic science, he parried to the heart, "First, you decide which science is basic. And how much money it needs..."

Is it any surprise that the planned increase in expenditures for basic research lags behind the increase in total investments in science? The Academy of Sciences and higher educational institutions have only 31 of the 300 state assignments. In other words, hopes that state orders will finance prospective developments important for the entire country turned out to be groundless. The Auto of the 21st Century program was entered into the ranks of state programs, even though individual automotive concerns all over the world are successfully coping with similar problems.

The deputies understood all this very well. They even tried somehow to protest. But their protests faded into the air. The idea of a strange incongruity between the solid procedural form of the event—the USSR Supreme Soviet Preliminary Commission session—and its shaky content unwillingly arose.

The recent Party conference decided to expand the role of the Councils. One would logically expect that, on the course chosen, the Preliminary Commission sessions would become sort of a general rehearsal. It is here that ministry executives give an example of the new attitude toward popular power and to its representatives. But....

"Everything was as in past years. Nothing has changed!" I. Kubilyus, academician of the Lithuanian SSR Academy of Sciences and presiding deputy, assessed the current session. "The ministries and departments maintained a purely formal approach toward participation in the commission's work." In fact, the session resembled a cross between a press conference for deputies and an instructive lecture. The superficial preparation on the part of several ministry and department representatives and their low rank, which eliminated any possibility of making critical decisions, demonstrated a condescending attitude toward the commission.

As before, the deputies had to take these people's word: The very procedure for preparing for and holding the session eliminated the possibility of checking the information presented to them. There would not even be any legal recourse if there were an attempt, intentional or not, to mislead the deputies. Moreover, they had only 3 days for the entire job. And although commission member M. Aripdzhanov, first secretary of the Andizhan obkom of the Communist Party of Uzbekistan, demanded that they "write specifically, otherwise it's all pointless," his challenge was not and could not have been met. The deputies had to sign a vague document containing general recommendations. But even then it was strictly limited in scope.

In the grips of a formal approach, the Preliminary Commission session, which could have been a step on the road to a new strategy, turned out in fact to be a session of forfeited opportunities. Will not next year be the same for scientific-technical progress?



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